

## PATENT ABSTRACTS OF JAPAN

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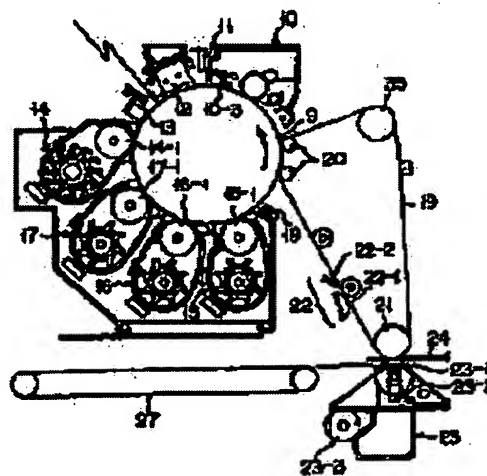
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## (54) IMAGE FORMING METHOD USING INTERMEDIATE TRANSFER SYSTEM

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent partial transfer failure (void) which occurs during transfer and image-reproducibility failure due to toner dust by keeping amounts of developer electrification high in order where developing toners in separate colors are developed onto an image carrier, and setting the absolute values of the amounts of developer electrification to specific ranges.

**SOLUTION:** Developing units 14-17 scoop up developers together with developing sleeves 14-1-17-1 rotating in such a manner that the developers face the photoreceptor 9 in order to develop an electrostatic latent image, and each of them is composed of a developing paddle rotating for stirring, a developer-toner concentration detection sensor, etc. In the image forming method using the intermediate transfer system, the amounts of developer electrification are made high in order of developing at least the black, cyan, magenta, yellow toners onto the image carrier 9, and the absolute values of the amounts of electrification are set to  $10-30 \mu\text{C/g}$ . Thus, a satisfactory transfer characteristic can be obtained, and development having void and transfer dust can be prevented.



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JAPANESE

[JP,10-207164,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS  
DRAWINGS

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[Translation done.]

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**CLAIMS**

[Claim(s)]

[Claim 1] Repeat the process which imprints the toner image on an image support primarily on an endless-like middle imprint object two or more times, pile it up, and a transfer picture is formed. In the image formation method using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material The image formation method characterized by holding highly the amount of electrifications of the developer which uses at least the toner which consists of black, cyanogen, a Magenta, and a yellow color for the order developed one by one on an image support, and making the absolute value of the amount of electrifications of the developer used into 10-30microc/g.

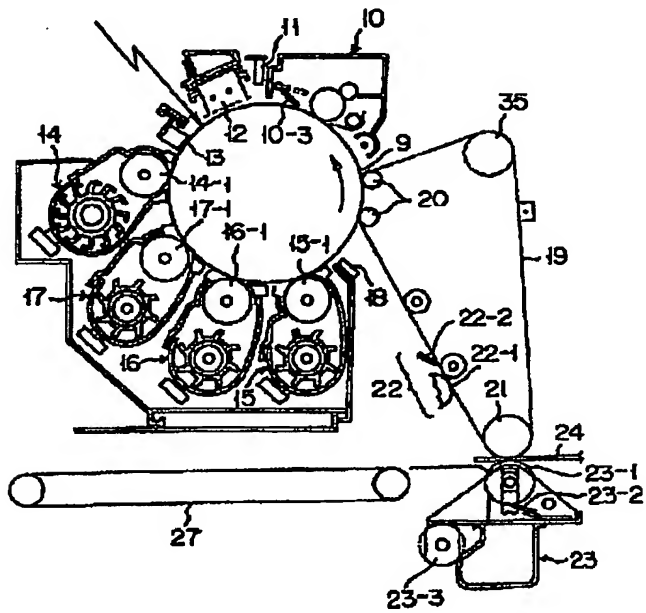
[Claim 2] The image formation method according to claim 1 which the toner used the account of before contains a hydrophobic silica at least, and is characterized by the degree of condensation being 5 - 25%.

[Claim 3] The image formation method using the middle imprint method according to claim 1 characterized by for the degrees of coloring of each toner used the account of before being 2.2-2.8, and the volume mean particle diameter of this toner being 4-9 micrometers.

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[Translation done.]

Drawing selection [Representative drawing] ☐



[Translation done.]

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**JAPANESE**

[JP,10-207164,A]

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention makes middle imprint objects, such as a middle imprint belt, intervene, and relates to the image-formation method and the image-formation equipment which perform image formation through each imprint process of the primary imprint which imprints a toner image from an image support to a middle imprint object, and the secondary imprint which imprints the primary transfer picture on a middle imprint object to imprint material in detail about the image-formation method and the image-formation equipment which used electrophotography methods, such as a copying machine, a printer, and facsimile.

[0002]

[Description of the Prior Art] The image formation method of a middle imprint method and equipment which pile up one by one on an image support, for example, the middle imprint object which runs two or more visible color development pictures formed one by one on a photo conductor in the shape of endless, for example, a middle imprint belt, imprint the first [ in all ] order, and imprint the primary transfer picture on this middle imprint object secondarily collectively to imprint material are known. The middle imprint method is especially adopted as a heavy imprint method of each color toner image in the so-called full color image formation equipment reproduced using the subtractive color mixture according the manuscript picture whose color was separated to toners, such as black, cyanogen, a Magenta, and yellow.

[0003] In such the image formation method and equipment, it originates in the local imprint omission at the time of the primary imprint of the toner which constitutes a color development picture, and a secondary imprint, and a toner is not locally imprinted at all in the picture on the imprint material by the transfer paper which is a final picture medium, but the so-called worm-eaten-like portion may be produced. The example of the picture of the shape of such worm-eaten is shown in drawing 1 . as a sign (w) shows in the case of an area picture, and also a worm-eaten-like picture generates a certain area by the \*\*\*\*\* imprint omission and the bird clapper in drawing 1 -- the case of a line picture -- a line -- \*\*\*\*\* -- it generates by producing an imprint omission like In order to abolish this unusual picture, it is making it an imprint omission not occur, and it is got blocked and technology which is expressed below is proposed as technology for it that what is necessary is just to raise imprint nature.

[0004] The existing technology for raising imprint nature can be classified into the following five.

(1) By using an elastomer for the technical a. middle imprint object about surface roughness reduction of a middle imprint object, and specifying the surface roughness of a middle imprint object What the adhesion of a middle imprint object and imprint material is raised, and aims at improvement and worm-eaten-like picture generating prevention for imprint nature (JP,3-242667,A), And the surface roughness of b. middle imprint object is specified, and there are some (JP,63-194272,A, JP,4-303869,A, JP,4-303872,A, JP,5-193020,A) which aim at



worm-eaten-like picture generating prevention on an imprint disposition.

[0005] The conventional technology which belongs under the category of these (1) can say that it is accompanied by electric discharge development about the toner imprint which comes out between the image support in a primary imprint process, the middle imprint object between middle imprint objects and in a secondary imprint process, and imprint material. Here, supposing a middle imprint body surface is the surface roughness of the shape of extreme irregularity, the imprint electric field over the toner on heights and a crevice will turn into heights imprint electric-field > crevice imprint electric field, and heights imprint electric field will become large relatively.

[0006] The reason can be explained as follows. Namely, when the electrode (I) which has a flat front face, and the electrode (II) which has the serrate front face which meets this electrode (I) through a minute air gap (Gp) are assumed with reference to drawing 2, The toner imprint electric field between an image support, between middle imprint objects and a middle imprint object, and the transfer media between imprint material etc. As air gap electric field between these transfer media, they are primary imprint electric field... Air gap electric-field secondary imprint electric field between an image support / middle imprint object ... The air gap electric field between a middle imprint object / imprint material can explain.

[0007] In drawing 2, when heights were set to (II-1), the crevice was set to (II-2) and imprint bias voltage is impressed to an electrode (I) and an electrode (II), as compared with the crevice (II-2) from which are separated of a distance inter-electrode [ these ], electric discharge concentrates on heights (II-1) with a short distance. That is, it becomes heights air gap electric-field > crevice air gap electric field. For the same reason, the air gap electric field of heights when the surface roughness of a middle imprint object is large, and a crevice turn into heights imprint electric-field > crevice imprint electric field.

[0008] Since it is such and is located in electric field with the larger toner in heights as compared with the toner in a crevice when it considers that the toner configuration of heights and crevice both is the same, it becomes that it is easy to imprint in response to the big electrostatic force. That is, as compared with heights, it can be said that a crevice is hard to imprint. Moreover, since the adhesion force to the middle imprint object of the toner located in DETCHI of a crevice etc. is larger than the adhesion force to the middle imprint object of the toner located in the edge of heights etc., it can be said that a crevice is hard to imprint.

[0009] That is, a touch area becomes [ the direction of the \*\*\*\* crevice contact shown in drawing 3 (c) and drawing 3 (d) compared with the \*\*\*\* heights contact shown in the \*\*\*\* flat-surface contact which showed the effective adhesion side of a toner to drawing 3 (a) supposing the field which performed / one grain of toner / hatching for the contact surface with the sign (T) in \*\*\*\* in drawing 3 showed, respectively, and drawing 3 (b), respectively ] large. When a mutual material which contacts is the same system, since van der Waals' forces work to vicinal faces (= adhesion side), the size of an effective adhesion side serves as size of adhesion force, and homonymy. Therefore, it becomes crevice adhesion force > heights adhesion force.

[0010] It can be said that it is good that granularity makes it a few inclination from the above thing to the level from which the difference in the imprint nature by surface irregularity does not pose a parenchyma top problem as for the relative roughness of a middle imprint body surface. Although this is also being able to say a photo conductor, it is common knowledge for the surface roughness of a photo conductor to go back to the drum using Se photo conductor in ancient times, and to suppress the surface roughness to constant value in consideration of imprint nature about this photo conductor. Therefore, it is meaningful for generating prevention of a worm-eaten-like picture to adjust the relative roughness of a middle imprint body surface to the level from which the difference in the imprint nature by irregularity does not pose a parenchyma top problem.

[0011] However, there is a limit in reduction-ization of the surface roughness of a middle imprint object, and surface irregularity is not only the irregularity of an always fixed configuration as

shown in drawing 2 . It is not that to which field strength only becomes settled according to the distance between crevice-heights in the case of the irregularity from which a configuration differs, either. For example, the difference in the charge degree of concentration by the difference in the size of the width of face even if heights are the same height, For example, it changes also with differences in whether it is the thing of an obtuse angle which has the top area which does not have so much whether the nose of cam of heights is the sharp thing of an acute angle which a charge tends to concentrate, and concentration of a charge, and a problem imprint object mutual [ actual / each ] is not so simple.

[0012] (2) The linear velocity between the technical transfer media about a setup of the linear-velocity difference between transfer media is specified, and what aims at worm-eaten-like prevention [ unusual picture generating ] (JP,2-213882,A) is mentioned on an imprint disposition.

[0013] About this conventional technology of (2), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. When the linear velocity of a photo conductor and a middle imprint object is equal, you have to make the electric force act so that a toner may be shifted to a middle imprint object side only in imprint electric field to the adhesion force which works between a photo conductor and a toner. (however, when establishing a linear-velocity difference between a photo conductor and a middle imprint object (i.e., when a fixed linear-velocity difference is among both), and when) The both sides of the mechanical force which originates in the speed difference of a photo conductor and a middle imprint object to a toner on the occasion of an imprint, and the electric force by imprint electric field can be made to act. Therefore, if the latter on which the both sides of the mechanical force and the force by imprint electric field can be made to act can say that it excels in imprint nature and it considers a worm-eaten-like picture to be a phenomenon by microscopic imprint nature lack It can say that it is more advantageous to the dissolution of an unusual worm-eaten-like picture to establish a linear-velocity difference between transfer media (between a photo conductor and a middle imprint object). However, in establishing a linear-velocity difference between transfer media, shearing force is given to a toner image according to the linear-velocity difference, distortion of an image is produced, and it becomes a victory.

[0014] (3) Technical imprint nip pressure about reduction of imprint nip pressure is specification-ized, and what aims at worm-eaten-like picture generating prevention (JP,1-177063,A, JP,4-284479,A) is mentioned on an imprint disposition. About such conventional technology of (3), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. It is pressed by that a photo conductor and a middle imprint object are mechanical or electrostatic force on the occasion of the primary imprint (imprint nip pressure). That is, the toner which intervenes among both will be pressed. With contiguity of the between [ toner particles ] distance by this press, the Juan Dell Wace force increases and the attraction between the toner particle components by condensation of a toner also increases. It can be told from a viewpoint of these reasons to imprint nature that it is desirable to make imprint nip pressure low to the dissolution of a worm-eaten-like picture.

[0015] However, both transfer media are stuck more, and if things are advantageous because of maintenance of the exact imprint physical relationship of a toner and carry out mutual distance from this viewpoint small smoothly, there is a limit in reduction-ization of imprint nip pressure.

[0016] (4) Wettability of the technical a. middle imprint object material about reduction of the surface energy of a middle imprint object is specification-ized to smallness, and what aims at worm-eaten-like picture generating prevention (JP,2-198476,A, JP,2-212867,A) is mentioned on an imprint disposition. Here, wettability means the adhesion force between a liquid and a solid-state. Adhesion force is  $W = \gamma A (1 + \cos \theta)$ , when  $W$  shows the adhesion force which is the energy taken to pull apart the matter of a different kind, therefore sets the contact angle

when placing a liquid for the surface tension of a liquid on  $\gamma_A$  and a solid-state to  $\theta$ , and acts between these liquids and a solid-state... (1)

It can come out and express. It can ask for the surface tension (= critical surface tension) of the material which becomes X by the following methods. That is, the reagent with which surface tension ( $\gamma_A$ ) differs is dropped on Material X, a contact angle ( $\cos\theta$ ) is measured, and the surface tension ( $\gamma_A$ ) of a reagent and the relation of each contact angle ( $\cos\theta$ ) are plotted the appropriate back. It asks for the surface tension ( $\gamma_{cr}$ ) of the point that connect so-called each point of a JISUMAN plot, and the extension line crosses the line of  $\cos\theta=1$  concerning this plot. This called-for surface tension is called a critical surface tension (= surface tension).

[0017] Here, since it is I. reagent regularity supposing it measures wettability (W) of various material with the same arbitrary reagents, for example, water, surface tension  $\gamma_A$  in (1) formula becomes fixed.

RO., therefore wettability (W) and a contact angle ( $\cos\theta$ ) become proportionality.

It can be said from above-mentioned I and RO that measuring wettability (W) of various material with the same reagent is asking for the contact angle ( $\cos\theta$ ) with the same surface tension ( $\gamma_A$ ). On the other hand, in many cases, a JISUMAN plot serves as a straight line, and the inclination does not change extremely with material. As mentioned above, wettability comparison of material with the same reagent, for example, water, can say it also as surface tension comparison of material.

[0018] Although it is going to prevent generating of a worm-eaten-like picture with technology aforementioned JP,2-198476,A and given in JP,2-212867,A using a wettability small middle imprint material, in other words, this can be called what has prevented generating of a worm-eaten-like picture using a small middle imprint material of surface energy.

[0019] b. A middle imprint object considers as multilayer composition, the thing (JP,62-293270,A, JP,5-204255,A, JP,5-204257,A, JP,5-303293,A) which aims at worm-eaten-like picture generating prevention on an imprint disposition, and the matter which was excellent in the mold-release characteristic at c. middle imprint body surface supply further by making material excellent in the mold-release characteristic into the maximum surface, and what aims at worm-eaten-like picture generating prevention (JP,58-187968,A) can classify into the technology of the above (4) on an imprint disposition. With the technology of the above (4), the surface tension of a middle imprint object was stopped low, the mold-release characteristic over a toner was raised, and the imprint nature to imprint material is improved. It is a well-known fact that the adhesion force between dissimilar material is expressed as a function of surface tension, and the adhesion force of a toner to a middle imprint object increases with the increase in surface tension. Here, in the case of a pure substance, surface tension is surface energy and homonymy. Moreover, as well as wettability if it generally is not a pure substance, surface tension is treated as a substitution property of surface energy.

[0020] In the technology of the above (4), each adhesion force of a toner, an image support and a toner, a middle imprint object and a toner, and imprint material is force synthesizing all physical force that acts, such as an electrostatic force of each part material, and van der Waals' forces. And although reduction-izing of the surface energy in a middle imprint object is convenient in a secondary imprint so that I may be understood from the aforementioned explanation, in a primary imprint, it not necessarily always does not necessarily act advantageously.

[0021] (5) the technical Nakama imprint body surface about removal of the toner filming layer of a middle imprint body surface is refreshed by filming polish etc., imprint nature is maintained, and the things (JP,5-273893,A, JP,5-307344,A, JP,5-313526,A, JP,5-323802,A, etc.) which aim at prevention of worm-eaten-like picture generating by the passage of time are mentioned

[0022] among said technology of (1) - (4), temporarily, supposing the technical technical problem of (4) is attained and the surface tension of a middle imprint object is reduced as an

ideal, it will stop generating filming of a middle imprint object, and the technology of (5) will serve as needlessness. That is, it can be said that the technology of (5) is complement technology compensated with the technology of (4).

[0023] On the other hand, when performing the roller transfer through a roller as a means of a secondary imprint, it is easy to generate the worm-eaten picture in a secondary imprint process. It is based on two reasons, the following a and b.

a. In the case of a full color picture, toner thickness is thick, in addition to a bird clapper, with contact pressure with a roller, the mechanical adhesion force to a middle imprint object increases by increase of the mechanical adhesion force which is a non-Coulomb force between the front face of a middle imprint object and a toner occurring powerfully, i.e., roller \*\* by the pressure welding of a roller, the effective density of a toner increases, and van der Waals' forces increase by toner contiguity, consequently the adhesion force between toners to a middle imprint object increases.

[0024] b. In process in which an image formation process is repeated and performed, cause the filming phenomenon of a toner in which a toner adheres to a middle imprint body surface in the shape of a film, and adhesion force occurs between a middle imprint body surface and a toner. That is, although selection use of surface tension or the small material of surface energy is generally carried out so that toner filming may not occur on a middle imprint object, (i "the adhesion force corresponding to the surface tension between a middle imprint object and a toner") will be generated in that case. And once toner filming occurs, although the adhesion force between "a middle imprint object and a toner" serves as (ii "the adhesion force determined with the surface tension of toners"), it is clear here. [ of the adhesion force of (ii) being larger than the adhesion force of (i) ] Since the adhesion force between toners increases, while an imprint is not partially made by the above, an omission phenomenon occurs, and it can be said that a worm-eaten picture is produced.

[0025] It is the U.S. patent as a means to avoid this inside omission phenomenon, about generating of the worm-eaten picture in a secondary imprint process. There is technology indicated by the No. 5,053,827 specification (METHOD AND APPARATUS FOR INTERMITTENT CONDITIONING OF A TRANSFER BELT).

[0026] The roller (conditioning mean) which consists of members which consist of material of the fluorine system which has surface energy smaller than the middle imprint hair side of belt side energy as a middle imprint object is applied to a middle imprint belt front face, and this U.S. patent has the indication by having the conditioning process which reduces the surface energy of a middle imprint belt front face.

[0027] Furthermore, the middle imprint belt using the polycarbonate is made into an example. The early surface energy is 37 - 38 dyn-cm, and if a conditioning process is not used, it will go up to 40 - 45 dyn-cm. If 40 dyn-cm are exceeded, in order to suppose that the fault of an imprint will occur and to avoid this fault As described above, the roller formed with the material which used the fluorine of 30 or less dyn-cm as the base is applied to a belt, the thin coat layer of fluorine material is formed in a front face, and it is said that surface energy elevation of a belt front face is suppressed. Furthermore, this U.S. patent has conversely the indication of the purport which fault generates in the imprint to a middle imprint belt from a photo conductor, when hair side of belt side energy is lowered too much.

[0028] In the image formation equipment using the middle imprint belt (19) shown in drawing 1 mentioned later, when we used the middle imprint belt made from the polycarbonate, in the secondary imprint, the worm-eaten-like picture generated them in the passage of time.

[0029] Although the fault of a secondary imprint was canceled when the experiment which carried out the optimum dose application of the zinc stearate was conducted on the middle imprint belt as lubricant, when the coating weight of a toner decreased, the picture of the letter of "a blur" occurred and the generating place was checked, having happened at the primary imprint process became clear.

[0030] By the middle imprint belt using ETFE (ethylene-tetrapod FURORO ethylene copolymer) which is the material of a fluorine system, the above-mentioned "blur" phenomenon occurred from the first stage. As opposed to middle imprint hair side of belt side energy being suppressed by a certain level according to the aforementioned conditioning process, if this is checked with the conventional example Although the photo conductor which is a toner image support is grinding the front face with the cleaning-brush roller etc. A toner adheres to a front face in the shape of a film like a middle imprint belt with time, or Ozone, NOx, etc. are polluted by the electric discharge generation gas of a corona charger, surface energy goes up gradually, and it is thought that it is because a toner becomes easy to adhere to a photo conductor side mechanically and imprint nature is spoiled.

[0031] The black toner image imprinted as the image section reproduced in black toner monochrome, such as the black character section, in the equipment which has the order of imaging which piles up an image to the middle imprint object other than the fault by which some toner images are not imprinted actualizes degradation of this imprint performance also as fault conversely imprinted at subsequent processes to a photo conductor in order of black, cyanogen, a Magenta, and yellow. Incidentally, it is thought that fault occurred from the first stage by the middle imprint belt of ETFE because the surface energy differences of a photo conductor front face and a middle imprint belt front face differed greatly in the initial state.

[0032] In order to avoid such faults, when middle imprint hair side of belt side energy becomes high too much, with the technology concerning the aforementioned U.S. patent, it is carrying out to operating a conditioning process. A conditioning process is operated when the copy number of sheets decided beforehand is specifically exceeded.

[0033] However, it is clear un-arranging [ which interrupts copy work and operates a conditioning process ], and the middle imprint belt front face of be [ it / in a fixed state / necessarily ] is clear after the copy number of sheets always decided beforehand.

[0034] Moreover, if it observes about the toner used, in order to prevent a worm-eaten picture, the method of raising the fluidity of a toner and making the volatility at the time of an imprint raising, and the method of adding a resin particle etc. to a toner and preventing the consolidation of the toners by the press at the time of an imprint are learned. However, when improving the fluidity of a toner too much, there is a case where become easy to generate the phenomenon in which a toner breaks up, and faithful reappearance of a character etc. becomes impossible at the time of an imprint.

[0035]

[Problem(s) to be Solved by the Invention] Therefore, the purpose of this invention cancels the trouble in the above-mentioned conventional technology, and is in the image formation method using the middle imprint method to prevent the local poor imprint (worm-eaten) generated at the time of an imprint, and the poor repeatability of the picture by the dust of a toner.

[0036]

[Means for Solving the Problem] The above-mentioned technical problem repeats the process which imprints the toner image on (1) "image support of this invention primarily on an endless-like middle imprint object two or more times, piles it up, and forms a transfer picture. In the image formation method using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation method characterized by making the absolute value of the amount of electrifications of the developer used into 10-30microc/g", (2) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation method given [ aforementioned ] in (1) term characterized by the degree of condensation being 5 - 25%" and the account of before (3) " are 2.2-2.8. It is solved by and the image formation method using the middle imprint method given [

aforementioned ] in (1) term characterized by the volume mean particle diameter of this toner being 4–9 micrometers.” Moreover, (4) Repeat the process which imprints the toner image on an image support primarily on an endless-like middle imprint object two or more times, pile it up, and a transfer picture is formed. In the image formation equipment using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation equipment characterized by making the absolute value of the amount of electrifications of the developer, used into 10–30microc/g”, (5) The toner used the account of before ” contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation equipment given [ aforementioned ] in (4) terms characterized by the degree of condensation being 5 – 25%” and the account of before (6) ” are 2.2–2.8. It is solved by and the image formation equipment using the middle imprint method given [ aforementioned ] in (4) terms characterized by the volume mean particle diameter of this toner being 4–9 micrometers.”

[0037] Although it passes through the process imprinted at once on imprint material (secondary imprint) after the toner of a color with which this inventions differ on a middle imprint object in the target image formation method laps, on a middle imprint object, each color toner is imprinted one by one from an image support (primary imprint). In this case, the fault that the amount of electrifications becomes easy to rise, the imprint property of the toner at the time of a secondary imprint will change with order of a primary imprint in order to receive many charge histories on a middle imprint object, and the color tone of a color picture will differ from an original manuscript produces the toner imprinted primarily first. Such fault is canceled by this invention. Hereafter, this invention is explained in detail.

[0038] It became clear that the imprint property at the time of the secondary imprint of two or more colors regularity-izes by the color, and the color picture of the stable color tone is obtained by making the amount of electrifications of the developer to be used high in order of development as a result of this invention persons' examination. Moreover, the absolute value of the amount of electrifications of a developer is desirable, in order that considering as 10–30microc/g may be stabilized and it may acquire an imprint property.

[0039] Furthermore, in order to attain the purpose of this invention, it is necessary to give a suitable fluidity, and as for the degree of condensation, to the toner used for this invention, it is desirable that it is 5 – 25%. When the degree of condensation is less than 5%, the dust of the toner at the time of an imprint may be generated, and, in an adult case, worm-eaten may occur rather than 25% at the time of an imprint.

[0040] Measurement of the degree of condensation of a toner can be performed by the following methods. That is, using a powder circuit tester (Hosokawa Micron CORP. make), a screen (75 micrometers of openings, 45 micrometers, and 22 micrometers) is arranged in this order from a top, a 2g toner is supplied to the screen of 75 micrometers of openings, vibration is given for 30 seconds with the amplitude of 1mm, the weight of 0.5, and 0.3 and 0.1 is applied and added to each measurement, and the toner weight of each plus sieve after vibration is computed by percentage.

[0041] Moreover, it is effective in order that a hydrophobic silica may attain the purpose of this invention as an additive mixed especially to a toner. A hydrophobic silica usually shows the thing of the 50% or more of the degrees of hydrophobing here. The degree of hydrophobing of a silica impalpable powder is controllable by carrying out surface treatment (hydrophobing processing) of the front face of a silica impalpable powder with a silane system compound. That is, a silane compound is made to react to the hydroxyl group combined with the silica impalpable powder, and it can control by replacing a hydroxyl group by the siloxyl machine etc. Therefore, the degree of hydrophobing is the rate of the hydroxyl group which disappeared by the above-mentioned reaction among the hydroxyl groups which existed before hydrophobing.

Hydrophobing processing is performed by making a dialkyl dihalogen-ized silane, a trialkyl halogenation silane, hexa alkyl disilazane, an ARUKIRUTORI halogenation silane, etc. react to a silica impalpable powder under an elevated temperature.

[0042] Moreover, the degree of hydrophobing of the aforementioned silica impalpable powder can be measured by the following method. That is, 50ml of water is put into a 200ml beaker, and a 0.2 moreg silica impalpable powder is added. and ml of the dropping methanol when the silica impalpable powder which adds a methanol and is appearing from the buret with which the nose of cam was immersed underwater beginning to sink, and sinking completely at the time of dropping, agitating gently by the magentic stirrer, -- reading -- degree of hydrophobing = [(-- ml of a dropping methanol -- a number --)/(ml of 50+ dropping methanol number)]x100 (%) since -- it asks The degree of hydrophobing of a silica impalpable powder is so high that the value of the degree of hydrophobing is large since the silica impalpable powder which carried out the role of a surfactant in this case, and has floated with dropping of a methanol distributes a methanol underwater through a methanol. Moreover, 0.1-2.0 weight section addition of the content of the hydrophobic silica used for this invention is carried out to the toner particle 100 weight section. Moreover, it is a 0.3 - 1.5 weight section grade especially preferably.

[0043] Furthermore, it became clear to phenomena, such as worm-eaten [ at the time of the above-mentioned imprint ], and dust of a toner, that the direction with little coating weight per unit area of the toner developed is advantageous as a result of this invention persons' examination.

[0044] That is, although a toner is further transferred to imprint material, when there is much coating weight of a toner, condensation of toners is promoted by the consolidation of a toner by the press at the time of an imprint, and it is easy to generate dust from an image support, without [ a middle imprint object and ] becoming easy to generate worm-eaten and being able to perform transition of a still more faithful toner.

[0045] Moreover, although it is generally desirable for high-definition-izing to diameter[ of a granule ]-ize a toner, it becomes easy to generate the aforementioned worm-eaten phenomenon by diameter[ of a granule ]-izing. Therefore, although it is desirable to lessen development coating weight of a toner further, picture concentration runs short in this case, and a high-definition picture is no longer acquired.

[0046] Therefore, it is necessary to raise the degree of coloring of a toner. On the other hand, when there is too little coating weight of a toner, the feeling of ZARATSUKI of a picture comes to be conspicuous. As for the degree of coloring of these points to a toner, being referred to as 2.2-2.8 is desirable.

[0047] The degree of coloring of a toner was measured as follows here. That is, toner 1 mg/cm<sup>2</sup> was made to adhere to a transfer paper (the Ricoh make, Types 6000 and 70W), the fixing equipment of the Ricoh pulley tail 550 was passed, and picture concentration was measured for the fixing picture with the 938 SUPEKUTORO densitometer made from X-Rite. Moreover, as for the volume mean particle diameter of the toner used for this invention, it is desirable to be referred to as 4-9 micrometers. While the feeling of ZARATSUKI of a picture is lost by being referred to as 9 micrometers or less, a picture with high resolution is acquired. Moreover, in the case of less than 4 micrometers, worm-eaten [ at the time of an imprint ] may occur.

[0048] Hereafter, the toner and developer which are used for this invention are explained in detail. As a binder resin used in the toner used by this invention, all the things used as a binding resin for toners from the former are applied. Specifically Styrene, such as polystyrene, poly p-chloro styrene, and polyvinyl toluene, and the polymer; styrene-p-chloro styrene copolymer of the substitution product, A styrene-propylene copolymer, a styrene-vinyltoluene copolymer, A styrene-vinyl naphthalene copolymer, a styrene-methyl-acrylate copolymer, A styrene-ethyl-acrylate copolymer, a styrene-butyl-acrylate copolymer, A styrene-acrylic-acid octyl copolymer, a styrene-methyl-methacrylate copolymer, A styrene-ethyl-methacrylate copolymer, a styrene-methacrylic-acid butyl copolymer, A styrene-alpha-crawl



methyl-methacrylate copolymer, a styrene acrylonitrile copolymer, A styrene-vinyl methyl-ether copolymer, a styrene-vinyl ethyl ether copolymer, A styrene-vinyl methyl ketone copolymer, a styrene-butadiene copolymer, A styrene-isoprene copolymer, a styrene-acrylonitrile-indene copolymer, Styrene system copolymers, such as a styrene-maleic-acid copolymer and a styrene-maleate copolymer; A polymethylmethacrylate, Poly butyl methacrylate, a polyvinyl chloride, polyvinyl acetate, polyethylene, Polypropylene, polyester, a polyvinyl butyl butyral, a polyacrylic resin, These are independent, or rosin, denaturation rosin, a terpene resin, phenol resin, aliphatic series or an alicycle group hydrocarbon resin, an aromatic system petroleum resin, chlorinated paraffin, paraffin wax, etc. are mentioned, and they are used by two or more sorts, mixing. In these, especially desirable things are a polyol resin, polyester, and an epoxy resin in this invention.

[0049] In the toner of this invention, in order to give suitable electrification for a toner, it is desirable to make an electrification control agent contain. As an electrification control agent in this case, the matter of a white system is added from the transparent plane color which does not spoil the color tone of a color toner, and what can carry out stabilization grant of the toner electrification nature is desirable to negative polarity or straight polarity. Specifically, as a thing of straight polarity, quarternary ammonium salt, an imidazole metal complex, salts, etc. are used, and a salicylic-acid metal complex, salts, organic boron salts, a calyx allene system compound, etc. are used as a thing of negative polarity.

[0050] Moreover, the stain pigment as a coloring agent which can obtain the toner of yellow, a Magenta, cyanogen, and a black color can be used. for example, independent in any conventionally well-known stain pigments, such as stain pigments, such as carbon black, lamp black, ultramarine blue, the aniline blue, a copper phthalocyanine blue, a Phthalocyanine Green, Hansa yellow G, rhodamine 6G, a lake, a KARUKO oil blue, chrome yellow, a Quinacridone, a benzidine yellow, a rose bengal, and a triaryl methane system color, -- or it can be used, mixing The amount of these coloring agents used is usually 3 - 20 % of the weight preferably one to 30% of the weight to a binding resin.

[0051] Moreover, it is possible to add hydrophobic titanium oxide, a hydrophobic alumina, etc. in order to raise the fluidity other than the hydrophobic silica shown in this invention as an external additive added to a toner. In addition, you may add fatty-acid metal salts (a zinc stearate, aluminum stearate, etc.), a polyvinylidene fluoride, etc. if needed.

[0052] Moreover, it is possible to give electrification to a toner, to mix with a carrier in order to convey a toner in a development unit, and to use it as a two component developer. That by which iron powder with a particle size of about 20-200 micrometers, nickel powder, ferrite powder, the glass bead, etc. coated the front face with the mixture of these resins, such as a styrene-acrylic-ester copolymer, a styrene-methacrylic-ester copolymer, an acrylic-ester polymer, a methacrylic-ester polymer, silicone resin, polyamide resin, an ionomer resin, and polyphenylene sulfide resin, by making these into a core material as a carrier again is used.

[0053]

[Embodiments of the Invention] Hereafter, this invention shoots based on drawing 4 , and the example of the image formation method and the example of equipment are further explained to a detail. In the equipment of drawing 4 , the color picture data from the color scanner which is not illustrated are changed into a lightwave signal, and an electrostatic latent image is formed in a photo conductor (9) of the write-in optical unit which performs the optical writing corresponding to the manuscript picture and which is not illustrated. This optical unit is well-known in itself, and consists of a laser diode, a polygon mirror, a polygon motor, an image formation lens, a reflective mirror, etc. a photo conductor (9) -- an arrow -- like -- a counterclockwise rotation -- rotating -- although -- The cleaning unit which contains a front [ cleaning ] electric discharge machine, a KUNININGU roller, and a cleaning blade (10-3) in the surroundings of it (10), electric discharge -- a lamp -- (-- 11 --) -- electrification -- a vessel -- (-- 12 --) -- potential -- a sensor -- (-- 13 --) -- Bk -- a development counter -- (-- 14 --) -- C -- a



development counter -- (-- 15 --) -- M -- a development counter -- (-- 16 --) -- Y -- a development counter -- (-- 17 --) -- development -- concentration -- a pattern -- a detector -- (-- 18 --) -- middle -- an imprint -- a belt Each development counter (14) - (17) consists of a development paddle which rotates in order to pump up and agitate development - (17-1) and the sleeve (14-1) which are rotated so that a developer may be made to counter a photo conductor (9), in order to develop an electrostatic latent image, and a developer, a toner concentration detection sensor of a developer, etc. Here, the example which set sequence (color toner formation sequence) of development operation to Bk, C, M, and Y explains operation below (however, sequence is not restricted to this).

[0054] If copy operation understands and is carried out, the read of Bk image data will start from timing predetermined with the color scanner which is not illustrated, and the optical writing by the laser beam and latent-image formation will start based on this image data (Bk latent image is called hereafter.). Suppose that it is the same also about C, M, and Y. That development should be made possible from the point of this Bk latent image, before a latent-image point arrives at the development position of Bk development counter (14), the rotation start of the development sleeve (14-1) is carried out, and Bk latent image is developed with Bk toner (the amount of electrifications is held to the minimum). Then, although development operation of Bk latent-image field is continued, when Bk latent-image back end section passes through Bk development position, it changes into a development non-operative state. This is made to complete at least before the following C picture point reaches.

[0055] Subsequently, Bk toner image formed on the photo conductor (9) is imprinted on the front face of the middle imprint belt (19) by which the uniform drive is carried out with the photo conductor (9) (the toner image imprint to a middle imprint belt (19) from a photo conductor (9) is hereafter called "primary imprint"). A primary imprint is performed by impressing imprint bias voltage in the state where the photo conductor (9) and the middle imprint belt (19) contacted. And the toner image of Bk, C, M, and Y which are formed in a middle imprint belt (19) one by one at a photo conductor (9) is aligned one by one to the same side, the primary transfer picture of 4 color piles is formed, and a package imprint (secondary imprint) is performed to a transfer paper after that. About the unit configuration of this middle imprint belt (19), and operation, it mentions later.

[0056] Although it progresses after Bk process in a photo conductor (9) side at C process which used C toner which next held the amount of electrifications small, C picture read by the color scanner begins from predetermined timing, and C latent-image formation is performed in the laser beam writing by the image data. After previous Bk latent-image back end section passed to the development position, and before the nose of cam of C latent image reaches, C development counter (15) carries out the rotation start of the development sleeve (15-1), and develops C latent image with C toner which held the amount of electrifications small to the 2nd. Although the development of C latent-image field is continued after that, when the latent-image back end section passes, it changes into a development non-actuation state like the case of previous Bk development counter. a mist [ this ] beam -- it is made to complete before the following M latent-image point reaches About the process of M and Y, since the amount of electrifications uses the toner held greatly one by one and also operation of each image data read, latent-image formation, and development is the same as that of the process of above-mentioned Bk and C, explanation is omitted.

[0057] The middle imprint belt (19) is constructed over the imprint bias roller (20), the drive roller (21), and the follower roller (35), and drive control is carried out from the drive motor 2 which is not illustrated. A belt cleaning unit (22) is constituted by the brush roller (22-1) which the abbreviation half has exposed, rubber blade (22-2) \*\*, etc., and carries out attachment-and-detachment operation according to the attachment-and-detachment mechanism which is not illustrated. The timing of this attachment-and-detachment operation is made to desert a middle imprint belt (19) side until the primary imprint of Y (this example four

amorous glance of the last color) is completed from a print start, is subsequent predetermined timing and cleans by making a middle imprint belt (19) side contact according to the aforementioned attachment-and-detachment mechanism.

[0058] The paper imprint unit (23) consists of attachment-and-detachment mechanisms (23-3) from a paper imprint bias roller (23-1) (electric-field means forming for a secondary imprint), a roller cleaning blade (23-2), and a middle imprint belt (19) etc. Although this bias roller (23-1) has usually deserted the middle imprint belt (19), when carrying out the package imprint of the heavy picture of four colors formed in the middle imprint belt (19) side at a transfer paper (imprint material) (24), it takes timing, is pressed by the attachment-and-detachment mechanism (23-3), it impresses predetermined bias voltage to the aforementioned roller (23-1), and performs the imprint to a transfer paper (24). Thus, the transfer paper (24) by which the package imprint of the 4 color pile pictures was carried out from the middle imprint belt (19) side It is conveyed in a paper conveyance unit (27) by the fixing assembly which is not illustrated, and the full color copy by which weld fixing was carried out in the toner image with the fixing roller controlled by predetermined temperature and the pressurization roller is obtained. On the other hand, the front face of the photo conductor after a belt imprint (9) is cleaned in a cleaning unit (10), and is further discharged uniformly with an electric discharge lamp (11). Moreover, as mentioned above, to the predetermined timing after the belt imprint end of Y picture of the last color, according to the aforementioned attachment-and-detachment mechanism, cleaning of a middle imprint belt (19) presses a cleaning unit (22) to a middle imprint belt (19) side, and performs it.

[0059]

[Example] Hereafter, an example explains this invention to a detail further.

Example 1 <a black toner> Binding resin (polyol resin : softening temperature of 105 degrees C) The 100 weight sections Electrification control agent (fluorine-containing quaternary-ammonium-salt compound) The 0.8 weight sections Coloring agent (carbon black) After mixing enough with a blender, melting kneading of the 7 weight sections was carried out with 2 rolls which heated at 100-110 degrees C. Coarse grinding of the kneading object was carried out by the cutter mill after natural radiationnal cooling, the pulverizer using the jet stream removed fines after trituration using pneumatic elutriation equipment, and the parent coloring particle was obtained. Furthermore, to this parent coloring particle 100 weight section, the hydrophobic titanium oxide 0.8 weight section of the 60% of the degrees of hydrophobing was mixed in the Henschel mixer, and the toner was obtained. Moreover, it mixed with the turbular mixer at a rate of 5 weight sections to the carrier 100 weight section which carried out the surface coat of the silicone resin to the ferrite particle of 50 micrometers of mean particle diameters, and this toner was made into the developer. In addition, the volume mean particle diameter of the obtained toner was [ 2.0 and the degree of condensation of 9.2 micrometers and the degree of coloring ] 26, and the amount of electrifications of a developer was -16microc/g. Moreover, about cyanogen, the Magenta, and the yellow toner, the toner was created on the same conditions as a black toner in the following composition conditions, and the developer was acted similarly.

[0060]

[Table 1]

	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点105℃ 100重量部		
帯電制御剤	含フッ素四級アンモニウム塩化合物 (0.9重量部) (1.0重量部) (1.2重量部)		
着色剤	銅フタロシアニン ブルー顔料 (C.I.Pigment Blue 15) (2.0重量部)	キナクリドン系顔料 (C.I.Pigment Red 122) (4.0重量部)	ジスアゾ系顔料 (C.I.Pigment Yellow 17) (4.5重量部)
外添加剤	疎水性酸化チタン（疎水化度60%） (0.8重量部) (0.8重量部) (0.8重量部)		

The property of the obtained toner and a developer is shown in Table 7. Moreover, the good result was obtained, when set to the Ricoh pulley tail 550 the toner and developer which were obtained, negatives were developed in order of black, cyanogen, a Magenta, and yellow, imprint nature (toner dust and worm-eaten) in the character section at the time of 4 color piles was evaluated and evaluation of the ZARATSUKI nature of the solid section and picture concentration was performed further. In addition, the method of evaluation was enforced as follows.

[0061] Worm-eaten rank rank 5 at the time of an imprint It is completely the non-generated rank 4. Rank 3 which worm-eaten [ 1-2 ] can check with a magnifier although it cannot check visually Rank 2 which worm-eaten [ several ] can check with a magnifier although it can hardly check visually Rank 1 which can check worm-eaten visually That most characters have fallen out is [0062] which can be checked visually. Rank rank 5 of the imprint dust at the time of an imprint It is completely the non-generated rank 4. Rank 3 which can check few dust with a magnifier although it cannot check visually Rank 2 which several dust can check with a magnifier although it can hardly check visually Rank 1 which dust can check visually BOYAKE of the character by dust can check visually (one 10 times the scale factor [ Magnifier : ] of this).

[0063] ZARATSUKI nature rank rank 5 Uniform solid picture rank 4 Rank 3 which the nonuniformity of a picture can check slightly with a magnifier visually although it is uniform Rank 2 which can be checked with a magnifier although ZARATSUKI can hardly be checked visually Rank 1 which can check ZARATSUKI of a picture visually Monochromatic concentration is measured with the level picture concentration Macbeth reflection density meter (made in Macbeth) which ZARATSUKI of a picture is severe and cannot say as a solid picture.

[0064] Example 2 [0065]

[Table 2]

	ブラクトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点 110℃ 100重量部			
帯電制御剤	サリチル酸誘導体亜鉛塩			
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
着色剤	カーボンブラック	銅フタロシアニン ブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(7.2重量部)	(2.0重量部)	(3.8重量部)	(4.5重量部)
外添加剤	疎水性シリカ（疎水化度70%）			
	(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0066] Example 3 [0067]

[Table 3]

	ブラクトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点 110℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物		サリチル酸誘導体亜鉛塩	
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.2重量部)
着色剤	カーボンブラック	銅フタロシアニン ブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.0重量部)
外添加剤	疎水性シリカ（疎水化度80%）			
	(0.5重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0068] Example 4 [0069]

[Table 4]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点98℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩／サリチル酸誘導体亜鉛塩			
	(1.0/0.5重量部)	(0.8/0.7重量部)	(0.6/0.8重量部)	(0.4/0.9重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(5.8重量部)
外添加剤	疎水性シリカ（疎水化度80%）			
	(0.6重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0070] The example 1 of comparison [0071]

[Table 5]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点105℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物			
	(1.2重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.2重量部)
外添加剤	疎水性酸化チタン（疎水化度20%）			
	(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0072] The example 2 of comparison [0073]

[Table 6]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点 105℃ 100 重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物			
	(1.0 重量部)	(1.0 重量部)	(1.0 重量部)	(1.0 重量部)
着色剤	カーボンブラック	銅フタロシアニン ブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(1.2 重量部)	(5.0 重量部)	(9.0 重量部)	(9.0 重量部)
外添加剤	疎水性シリカ（疎水化度 30%）			
	(0.8 重量部)	(0.8 重量部)	(0.8 重量部)	(0.8 重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0074]

[Table 7]

実施例	トナー色 現像剤	結着樹脂 特電油類 類	カラムトナーの組成・特性					画像品質評価結果							
			添加量 (重量部)		外添加剤	体積平均 粒径(μm)	着色度	凝集度	現像剤 付着率 (wt%)	現像剤 付着量 (μg/cm <sup>2</sup> )	耐水性(45℃露光時)				
			添加量 (重量部)	添加量 (重量部)							耐水性 ランク	耐油性 ランク	耐擦性 ランク		
実施例 1	ブラック	ポリマ 樹脂	含有素4級 アモニア塩(A)	0.8	疎水性	0.8	9.2	2.0	26	5.0	16	4	4	5	○
	シアン			0.8	酸化ガ	0.8	8.9	2.0	27	5.0	18				○
	マゼンタ			1.0		0.8	9.2	2.1	28	5.0	19				○
	イエロー			1.2		0.8	9.3	1.9	27	5.1	21				○
実施例 2	ブラック	ポリマ 樹脂	含有素4級 アモニア塩(B)	1.0	疎水性	0.7	9.3	2.1	18	5.1	24	4.5	4.5	4.5	○
	シアン			1.0	シ	0.7	9.2	1.9	16	4.9	25				○
	マゼンタ			1.0		0.7	9.4	1.8	15	5.0	27				○
	イエロー			1.0		0.7	9.5	1.9	14	4.9	28				○
実施例 3	ブラック	ポリマ 樹脂	含有素4級 アモニア塩(A)	1.0	疎水性	0.5	8.1	2.4	23	4.8	20	5	5	5	◎
	シアン			1.0	シ	0.6	8.0	2.3	20	5.1	23				◎
	マゼンタ			1.0		0.7	8.3	2.4	18	5.0	24				◎
	イエロー			1.2		0.7	7.9	2.5	18	5.1	28				◎
実施例 4	ブラック	ポリマ 樹脂	(A)/(B)	1.0/0.5	疎水性	0.6	5.8	2.4	20	5.0	20	5	5	5	◎
	シアン			0.8/0.7	シ	0.6	6.5	2.2	20	5.1	22				◎
	マゼンタ			0.6/0.8		0.7	6.3	2.3	18	4.9	25				◎
	イエロー			0.4/0.9		0.7	6.4	2.3	19	4.9	28				◎
比較例 1	ブラック	ポリマ 樹脂	含有素4級 アモニア塩(A)	1.2	疎水性	0.7	6.2	2.3	33	5.5	20	2	2	5	×
	シアン			0.8	酸化ガ	0.7	6.5	2.3	34	5.5	16				×
	マゼンタ			0.8		0.7	6.8	2.3	33	5.4	15				×
	イエロー			0.8		0.7	6.4	2.3	35	5.6	15				×
比較例 2	ブラック	ポリマ 樹脂	含有素4級 アモニア塩(A)	1.0	疎水性	0.8	9.2	3.0	16	5.0	24	4	4	2	×
	シアン			1.0	シ	0.8	9.1	3.1	15	5.0	20				×
	マゼンタ			1.0		0.8	9.4	3.0	16	4.9	19				×
	イエロー			1.0		0.8	9.5	3.1	15	5.0	24				×

[0075]

[Effect of the Invention] As explained in detail and concretely, as mentioned above, this invention In the image formation method using the middle imprint method at least Black, The amount of electrifications of a developer makes high the toner which consists of cyanogen, a Magenta, and a yellow color at the order developed on an image support. And it is a good imprint property's being acquired, being able to prevent worm-eaten and development called imprint dust by making the absolute value of the amount of electrifications into 10-30microc/g, and a toner's containing a hydrophobic silica at least further, and making the degree of condensation into 5 - 25%. Furthermore, the extremely excellent effect that a good imprint property is acquired and also a still better imprint property is acquired by setting the degree of coloring of a toner to 2.2-2.8, and setting a volume mean particle diameter to 4-9 micrometers is

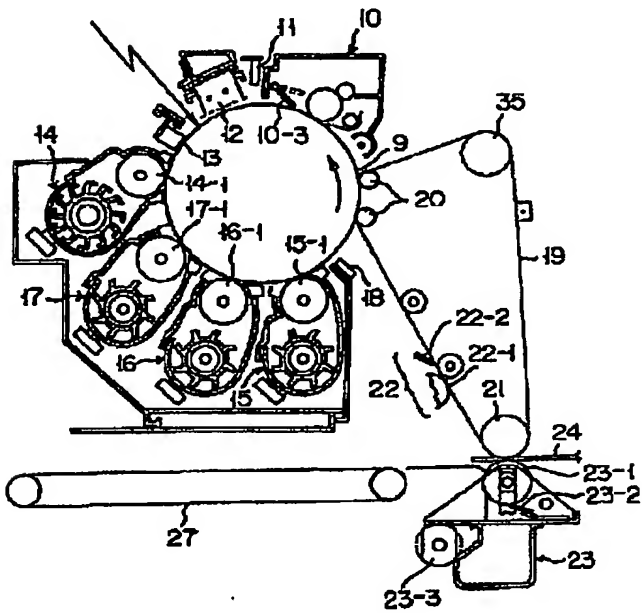
demonstrated.

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[Translation done.]



Drawing selection [Representative drawing]



[Translation done.]

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**JAPANESE**

[JP,10-207164,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS  
DRAWINGS

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[Translation done.]

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**TECHNICAL FIELD**

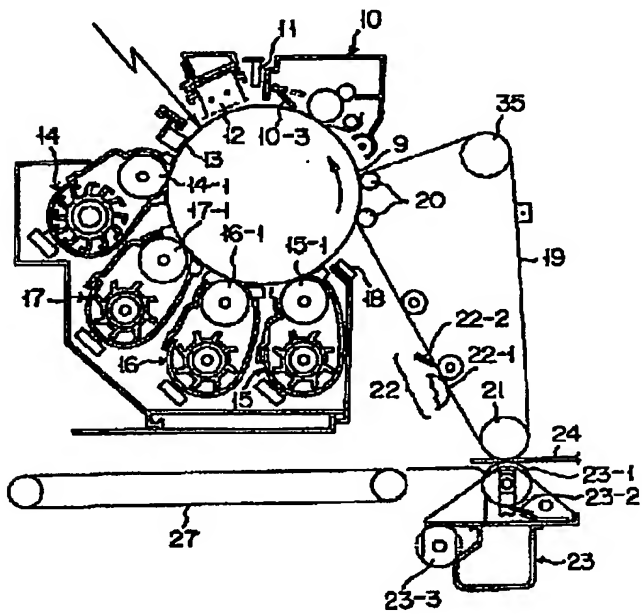
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[The technical field to which invention belongs] this invention makes middle imprint objects, such as a middle imprint belt, intervene, and relates to the image-formation method and the image-formation equipment which perform image formation through each imprint process of the primary imprint which imprints a toner image from an image support to a middle imprint object, and the secondary imprint which imprints the primary transfer picture on a middle imprint object to imprint material in detail about the image-formation method and the image-formation equipment which used electrophotography methods, such as a copying machine, a printer, and facsimile.

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[Translation done.]

Drawing selection [Representative drawing] ☒



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**PRIOR ART**

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[Description of the Prior Art] The image formation method of a middle imprint method and equipment which pile up one by one on an image support, for example, the middle imprint object which runs two or more visible color development pictures formed one by one on a photo conductor in the shape of endless, for example, a middle imprint belt, imprint the first [ in all ] order, and imprint the primary transfer picture on this middle imprint object secondarily collectively to imprint material are known. The middle imprint method is especially adopted as a heavy imprint method of each color toner image in the so-called full color image formation equipment reproduced using the subtractive color mixture according the manuscript picture whose color was separated to toners, such as black, cyanogen, a Magenta, and yellow.

[0003] In such the image formation method and equipment, it originates in the local imprint omission at the time of the primary imprint of the toner which constitutes a color development picture, and a secondary imprint, and a toner is not locally imprinted at all in the picture on the imprint material by the transfer paper which is a final picture medium, but the so-called worm-eaten-like portion may be produced. The example of the picture of the shape of such worm-eaten is shown in drawing 1 . as a sign (w) shows in the case of an area picture, and also a worm-eaten-like picture generates a certain area by the \*\*\*\*\* imprint omission and the bird clapper in drawing 1 -- the case of a line picture -- a line -- \*\*\*\*\* -- it generates by producing an imprint omission like In order to abolish this unusual picture, it is making it an imprint omission not occur, and it is got blocked and technology which is expressed below is proposed as technology for it that what is necessary is just to raise imprint nature.

[0004] The existing technology for raising imprint nature can be classified into the following five.

(1) By using an elastomer for the technical a. middle imprint object about surface roughness reduction of a middle imprint object, and specifying the surface roughness of a middle imprint object What the adhesion of a middle imprint object and imprint material is raised, and aims at improvement and worm-eaten-like picture generating prevention for imprint nature (JP,3-242667,A), And the surface roughness of b. middle imprint object is specified, and there are some (JP,63-194272,A, JP,4-303869,A, JP,4-303872,A, JP,5-193020,A) which aim at worm-eaten-like picture generating prevention on an imprint disposition.

[0005] The conventional technology which belongs under the category of these (1) can say that it is accompanied by electric discharge development about the toner imprint which comes out between the image support in a primary imprint process, the middle imprint object between middle imprint objects and in a secondary imprint process, and imprint material. Here, supposing a middle imprint body surface is the surface roughness of the shape of extreme irregularity, the imprint electric field over the toner on heights and a crevice will turn into heights imprint electric-field > crevice imprint electric field, and heights imprint electric field will become large relatively.

[0006] The reason can be explained as follows. Namely, when the electrode (I) which has a flat front face, and the electrode (II) which has the serrate front face which meets this electrode (I)



through a minute air gap (Gp) are assumed with reference to drawing 2 , The toner imprint electric field between an image support, between middle imprint objects and a middle imprint object, and the transfer media between imprint material etc. As air gap electric field between these transfer media, they are primary imprint electric field... Air gap electric-field secondary imprint electric field between an image support / middle imprint object ... The air gap electric field between a middle imprint object / imprint material can explain.

[0007] In drawing 2 , when heights were set to (II-1), the crevice was set to (II-2) and imprint bias voltage is impressed to an electrode (I) and an electrode (II), as compared with the crevice (II-2) from which are separated of a distance inter-electrode [ these ], electric discharge concentrates on heights (II-1) with a short distance. That is, it becomes heights air gap electric-field > crevice air gap electric field. For the same reason, the air gap electric field of heights when the surface roughness of a middle imprint object is large, and a crevice turn into heights imprint electric-field > crevice imprint electric field.

[0008] Since it is such and is located in electric field with the larger toner in heights as compared with the toner in a crevice when it considers that the toner configuration of heights and crevice both is the same, it becomes that it is easy to imprint in response to the big electrostatic force. That is, as compared with heights, it can be said that a crevice is hard to imprint. Moreover, since the adhesion force to the middle imprint object of the toner located in DETCHI of a crevice etc. is larger than the adhesion force to the middle imprint object of the toner located in the edge of heights etc., it can be said that a crevice is hard to imprint.

[0009] That is, a touch area becomes [ the direction of the \*\*\*\* crevice contact shown in drawing 3 (c) and drawing 3 (d) compared with the \*\*\*\* heights contact shown in the \*\*\*\* flat-surface contact which showed the effective adhesion side of a toner to drawing 3 (a) supposing the field which performed / one grain of toner / hatching for the contact surface with the sign (T) in \*\*\*\* in drawing 3 showed, respectively, and drawing 3 (b), respectively ] large.

When a mutual material which contacts is the same system, since van der Waals' forces work to vicinal faces (= adhesion side), the size of an effective adhesion side serves as size of adhesion force, and homonymy. Therefore, it becomes crevice adhesion force > heights adhesion force.

[0010] It can be said that it is good that granularity makes it a few inclination from the above thing to the level from which the difference in the imprint nature by surface irregularity does not pose a parenchyma top problem as for the relative roughness of a middle imprint body surface. Although this is also being able to say a photo conductor, it is common knowledge for the surface roughness of a photo conductor to go back to the drum using Se photo conductor in ancient times, and to suppress the surface roughness to constant value in consideration of imprint nature about this photo conductor. Therefore, it is meaningful for generating prevention of a worm-eaten-like picture to adjust the relative roughness of a middle imprint body surface to the level from which the difference in the imprint nature by irregularity does not pose a parenchyma top problem.

[0011] However, there is a limit in reduction-ization of the surface roughness of a middle imprint object, and surface irregularity is not only the irregularity of an always fixed configuration as shown in drawing 2 . It is not that to which field strength only becomes settled according to the distance between crevice-heights in the case of the irregularity from which a configuration differs, either. For example, the difference in the charge degree of concentration by the difference in the size of the width of face even if heights are the same height, For example, it changes also with differences in whether it is the thing of an obtuse angle which has the top area which does not have so much whether the nose of cam of heights is the sharp thing of an acute angle which a charge tends to concentrate, and concentration of a charge, and a problem imprint object mutual [ actual / each ] is not so simple.

[0012] (2) The linear velocity between the technical transfer media about a setup of the linear-velocity difference between transfer media is specified, and what aims at worm-eaten-like prevention [ unusual picture generating ] (JP,2-213882,A) is mentioned on an

imprint disposition.

[0013] About this conventional technology of (2), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. When the linear velocity of a photo conductor and a middle imprint object is equal, you have to make the electric force act so that a toner may be shifted to a middle imprint object side only in imprint electric field to the adhesion force which works between a photo conductor and a toner. (however, when establishing a linear-velocity difference between a photo conductor and a middle imprint object (i.e., when a fixed linear-velocity difference is among both), and when) The both sides of the mechanical force which originates in the speed difference of a photo conductor and a middle imprint object to a toner on the occasion of an imprint, and the electric force by imprint electric field can be made to act. Therefore, if the latter on which the both sides of the mechanical force and the force by imprint electric field can be made to act can say that it excels in imprint nature and it considers a worm-eaten-like picture to be a phenomenon by microscopic imprint nature lack It can say that it is more advantageous to the dissolution of an unusual worm-eaten-like picture to establish a linear-velocity difference between transfer media (between a photo conductor and a middle imprint object). However, in establishing a linear-velocity difference between transfer media, shearing force is given to a toner image according to the linear-velocity difference, distortion of an image is produced, and it becomes a victory.

[0014] (3) Technical imprint nip pressure about reduction of imprint nip pressure is specification-ized, and what aims at worm-eaten-like picture generating prevention (JP,1-177063,A, JP,4-284479,A) is mentioned on an imprint disposition. About such conventional technology of (3), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. It is pressed by that a photo conductor and a middle imprint object are mechanical or electrostatic force on the occasion of the primary imprint (imprint nip pressure). That is, the toner which intervenes among both will be pressed. With contiguity of the between [ toner particles ] distance by this press, the Juan Dell Wace force increases and the attraction between the toner particle components by condensation of a toner also increases. It can be told from a viewpoint of these reasons to imprint nature that it is desirable to make imprint nip pressure low to the dissolution of a worm-eaten-like picture.

[0015] However, both transfer media are stuck more, and if things are advantageous because of maintenance of the exact imprint physical relationship of a toner and carry out mutual distance from this viewpoint small smoothly, there is a limit in reduction-ization of imprint nip pressure.

[0016] (4) Wettability of the technical a. middle imprint object material about reduction of the surface energy of a middle imprint object is specification-ized to smallness, and what aims at worm-eaten-like picture generating prevention (JP,2-198476,A, JP,2-212867,A) is mentioned on an imprint disposition. Here, wettability means the adhesion force between a liquid and a solid-state. Adhesion force is  $W = \gamma A (1 + \cos\theta)$ , when  $W$  shows the adhesion force which is the energy taken to pull apart the matter of a different kind, therefore sets the contact angle when placing a liquid for the surface tension of a liquid on  $\gamma A$  and a solid-state to  $\theta$ , and acts between these liquids and a solid-state... (1)

It can come out and express. It can ask for the surface tension (= critical surface tension) of the material which becomes X by the following methods. That is, the reagent with which surface tension ( $\gamma A$ ) differs is dropped on Material X, a contact angle ( $\cos\theta$ ) is measured, and the surface tension ( $\gamma A$ ) of a reagent and the relation of each contact angle ( $\cos\theta$ ) are plotted the appropriate back. It asks for the surface tension ( $\gamma_{mae}$ ) of the point that connect so-called each point of a JISUMAN plot, and the extension wire crosses the line of  $\cos\theta=1$  concerning this plot. This called-for surface tension is called a critical surface tension (= surface tension).

[0017] Here, since it is I . reagent regularity supposing it measures wettability ( $W$ ) of various

material with the same arbitrary reagents, for example, water, surface tension  $\gamma_A$  in (1) formula becomes fixed.

RO., therefore wettability (W) and a contact angle ( $\cos\theta$ ) become proportionality.

It can be said from above-mentioned I and RO that measuring wettability (W) of various material with the same reagent is asking for the contact angle ( $\cos\theta$ ) with the same surface tension ( $\gamma_A$ ). On the other hand, in many cases, a JISUMAN plot serves as a straight line, and the inclination does not change extremely with material. As mentioned above, wettability comparison of material with the same reagent, for example, water, can say it also as surface tension comparison of material.

[0018] Although it is going to prevent generating of a worm-eaten-like picture with technology aforementioned JP,2-198476,A and given in JP,2-212867,A using a wettability small middle imprint material, in other words, this can be called what has prevented generating of a worm-eaten-like picture using a small middle imprint material of surface energy.

[0019] b. A middle imprint object considers as multilayer composition, the thing (JP,62-293270,A, JP,5-204255,A, JP,5-204257,A, JP,5-303293,A) which aims at worm-eaten-like picture generating prevention on an imprint disposition, and the matter which was excellent in the mold-release characteristic at c. middle imprint body surface supply further by making material excellent in the mold-release characteristic into the maximum surface, and what aims at worm-eaten-like picture generating prevention (JP,58-187968,A) can classify into the technology of the above (4) on an imprint disposition. With the technology of the above (4), the surface tension of a middle imprint object was stopped low, the mold-release characteristic over a toner was raised, and the imprint nature to imprint material is improved. It is a well-known fact that the adhesion force between dissimilar material is expressed as a function of surface tension, and the adhesion force of a toner to a middle imprint object increases with the increase in surface tension. Here, in the case of a pure substance, surface tension is surface energy and homonymy. Moreover, as well as wettability if it generally is not a pure substance, surface tension is treated as a substitution property of surface energy.

[0020] In the technology of the above (4), each adhesion force of a toner, an image support and a toner, a middle imprint object and a toner, and imprint material is force synthesizing all physical force that acts, such as an electrostatic force of each part material, and Van der Waals force. And although reduction-izing of the surface energy in a middle imprint object is convenient in a secondary imprint so that I may be understood from the aforementioned explanation, in a primary imprint, it not necessarily always does not necessarily act advantageously.

[0021] (5) the technical Nakama imprint body surface about removal of the toner filming layer of a middle imprint body surface is refreshed by filming polish etc., imprint nature is maintained, and the things (JP,5-273893,A, JP,5-307344,A, JP,5-313526,A, JP,5-323802,A, etc.) which aim at prevention of worm-eaten-like picture generating by the passage of time are mentioned

[0022] among said technology of (1) - (4), temporarily, supposing the technical technical problem of (4) is attained and the surface tension of a middle imprint object is reduced as an ideal, it will stop generating filming of a middle imprint object, and the technology of (5) will serve as needlessness That is, it can be said that the technology of (5) is complement technology compensated with the technology of (4).

[0023] On the other hand, when performing the roller transfer through a roller as a means of a secondary imprint, it is easy to generate the worm-eaten picture in a secondary imprint process. It is based on two reasons, the following a and b.

a. In the case of a full color picture, toner thickness is thick, in addition to a bird clapper, with contact pressure with a roller, the mechanical adhesion force to a middle imprint object increases by increase of the mechanical adhesion force which is a non-Coulomb force between the front face of a middle imprint object and a toner occurring powerfully, i.e., roller \*\* by the pressure welding of a roller, the effective density of a toner increases, and Van der Waals force

increases by toner proximity, consequently the adhesion force between toners to a middle imprint object increases.

[0024] b. In process in which an image formation process is repeated and performed, cause the filming phenomenon of a toner in which a toner adheres to a middle imprint body surface in the shape of a film, and adhesion force occurs between a middle imprint body surface and a toner. That is, although selection use of surface tension or the small material of surface energy is generally carried out so that toner filming may not occur on a middle imprint object, (i "the adhesion force corresponding to the surface tension between a middle imprint object and a toner") will be generated in that case. And once toner filming occurs, although the adhesion force between "a middle imprint object and a toner" serves as (ii "the adhesion force determined with the surface tension of toners"), it is clear here. [ of the adhesion force of (ii) being larger than the adhesion force of (i) ] Since the adhesion force between toners increases, while an imprint is not partially made by the above, an omission phenomenon occurs, and it can be said that a worm-eaten picture is produced.

[0025] It is the U.S. patent as a means to avoid this inside omission phenomenon, about generating of the worm-eaten picture in a secondary imprint process. There is technology indicated by the No. 5,053,827 specification (METHOD AND APPARATUS FOR INTERMITTENT CONDITIONING OF A TRANSFER BELT).

[0026] The roller (conditioning mean) which consists of members which consist of material of the fluorine system which has surface energy smaller than the middle imprint hair side of belt side energy as a middle imprint object is applied to a middle imprint belt front face, and this U.S. patent has the indication by having the conditioning process which reduces the surface energy of a middle imprint belt front face.

[0027] Furthermore, the middle imprint belt using the polycarbonate is made into an example. The early surface energy is 37 – 38 dyn-cm, and if a conditioning process is not used, it will go up to 40 – 45 dyn-cm. If 40 dyn-cm are exceeded, in order to suppose that the fault of an imprint will occur and to avoid this fault As described above, the roller formed with the material which used the fluorine of 30 or less dyn-cm as the base is applied to a belt, the thin coat layer of fluorine material is formed in a front face, and it is said that a surface energy rise of a belt front face is suppressed. Furthermore, this U.S. patent has conversely the indication of the purport which fault generates in the imprint to a middle imprint belt from a photo conductor, when hair side of belt side energy is lowered too much.

[0028] In the image formation equipment using the middle imprint belt (19) shown in drawing 1 mentioned later, when we used the middle imprint belt made from the polycarbonate, in the secondary imprint, the worm-eaten-like picture generated them in the passage of time.

[0029] Although the fault of a secondary imprint was canceled when the experiment which carried out the optimum dose application of the zinc stearate was conducted on the middle imprint belt as lubricant, when the coating weight of a toner decreased, the picture of the letter of "a blur" occurred and the generating place was checked, having happened at the primary imprint process became clear.

[0030] By the middle imprint belt using ETFE (ethylene-tetrapod FURORO ethylene copolymer) which is the material of a fluorine system, the above-mentioned "blur" phenomenon occurred from the first stage. As opposed to middle imprint hair side of belt side energy being suppressed by a certain level according to the aforementioned conditioning process, if this is checked with the conventional example Although the photo conductor which is a toner image support is grinding the front face with the cleaning-brush roller etc. A toner adheres to a front face in the shape of a film like a middle imprint belt with time, or Ozone, NOx, etc. are polluted by the electric discharge generation gas of a corona charger, surface energy goes up gradually, and it is thought that it is because a toner becomes easy to adhere to a photo conductor side mechanically and imprint nature is spoiled.

[0031] The black toner image imprinted as the image section reproduced in black toner

monochrome, such as the black character section, in the equipment which has the order of imaging which piles up an image to the middle imprint object other than the fault by which some toner images are not imprinted actualizes degradation of this imprint performance also as fault conversely imprinted at subsequent processes to a photo conductor in order of black, cyanogen, a Magenta, and yellow. Incidentally, it is thought that fault occurred from the first stage by the middle imprint belt of ETFE because the surface energy differences of a photo conductor front face and a middle imprint belt front face differed greatly in the initial state.

[0032] In order to avoid such faults, when middle imprint hair side of belt side energy becomes high too much, with the technology concerning the aforementioned U.S. patent, it is carrying out to operating a conditioning process. A conditioning process is operated when the copy number of sheets decided beforehand is specifically exceeded.

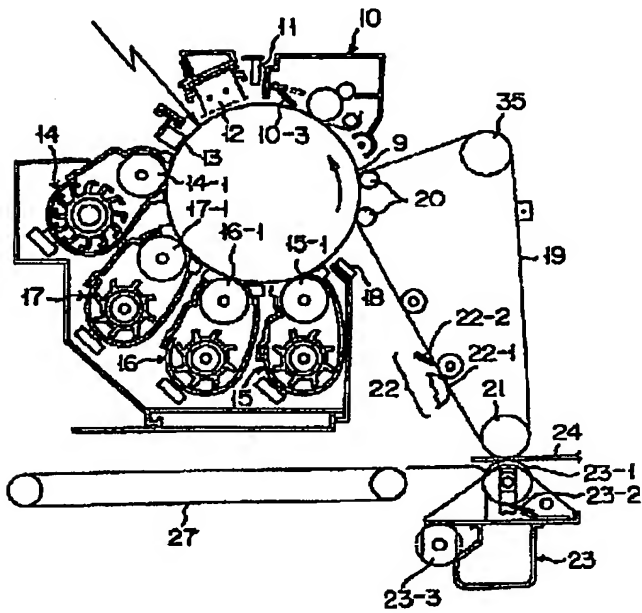
[0033] However, it is clear un-arranging [ which interrupts copy work and operates a conditioning process ], and the middle imprint belt front face of be [ it / in a fixed state / necessarily ] is clear after the copy number of sheets always decided beforehand.

[0034] Moreover, if it observes about the toner used, in order to prevent a worm-eaten picture, the method of raising the fluidity of a toner and making the volatility at the time of an imprint raising, and the method of adding a resin particle etc. to a toner and preventing the consolidation of the toners by the press at the time of an imprint are learned. However, when improving the fluidity of a toner too much, there is a case where become easy to generate the phenomenon in which a toner breaks up, and faithful reappearance of a character etc. becomes impossible at the time of an imprint.

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[Translation done.]

Drawing selection [Representative drawing] ☐



[Translation done.]

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**EFFECT OF THE INVENTION**

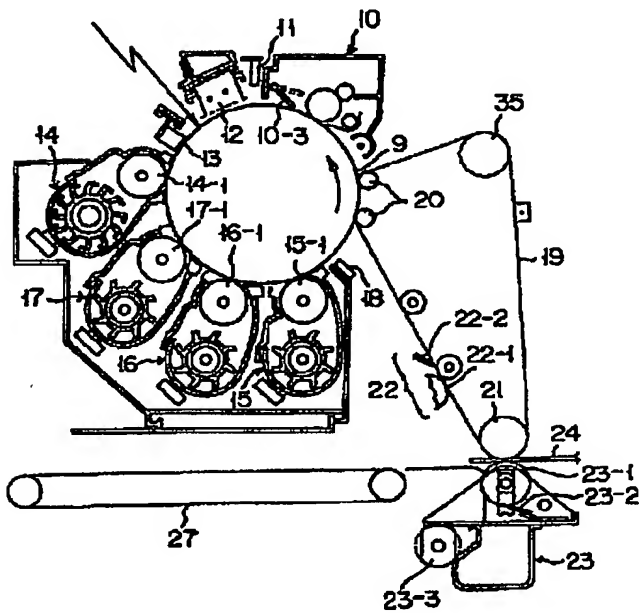
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[Effect of the Invention] As mentioned above, it is this invention as explained in detail and concretely. In the image formation method using the middle imprint method at least Black, The amount of electrifications of a developer makes high the toner which consists of cyanogen, a Magenta, and a yellow color at the order developed on an image support. And it is a good imprint property's being acquired, being able to prevent worm-eaten and development called imprint dust by making the absolute value of the amount of electrifications into 10-30microc/g, and a toner's containing a hydrophobic silica at least further, and making the degree of condensation into 5 - 25%. Furthermore, the extremely excellent effect that a good imprint property is acquired and also a still better imprint property is acquired by setting the degree of coloring of a toner to 2.2-2.8, and setting a volume mean particle diameter to 4-9 micrometers is demonstrated.

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[Translation done.]

Drawing selection [Representative drawing] ☒



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**TECHNICAL PROBLEM**

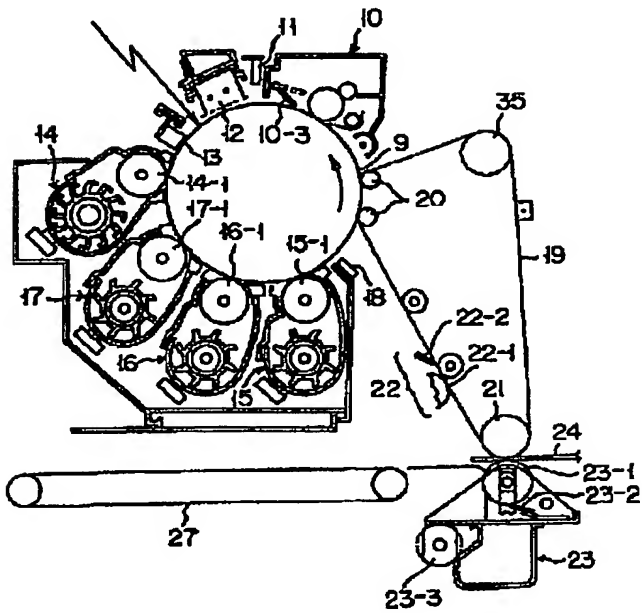
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[Problem(s) to be Solved by the Invention] Therefore, the purpose of this invention cancels the trouble in the above-mentioned conventional technology, and is in the image formation method using the middle imprint method to prevent the local poor imprint (worm-eaten) generated at the time of an imprint, and the poor repeatability of the picture by the dust of a toner.

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[Translation done.]

Drawing selection [R presentative drawing] 



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**MEANS**

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[Means for Solving the Problem] The above-mentioned technical problem repeats the process which imprints the toner image on (1) "image support of this invention primarily on an endless-like middle imprint object two or more times, piles it up, and forms a transfer picture. In the image formation method using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation method characterized by making the absolute value of the amount of electrifications of the developer used into 10-30microc/g", (2) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation method given [ aforementioned ] in (1) term characterized by the degree of condensation being 5 - 25%" and the account of before (3) " are 2.2-2.8. It is solved by and the image formation method using the middle imprint method given [ aforementioned ] in (1) term characterized by the volume mean particle diameter of this toner being 4-9 micrometers." "Moreover, (4) Repeat the process which imprints the toner image on an image support primarily on an endless-like middle imprint object two or more times, pile it up, and a transfer picture is formed. In the image formation equipment using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation equipment characterized by making the absolute value of the amount of electrifications of the developer used into 10-30microc/g", (5) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation equipment given [ aforementioned ] in (4) terms characterized by the degree of condensation being 5 - 25%" and the account of before (6) " are 2.2-2.8. It is solved by and the image formation equipment using the middle imprint method given [ aforementioned ] in (4) terms characterized by the volume mean particle diameter of this toner being 4-9 micrometers."

[0037] Although it passes through the process imprinted at once on imprint material (secondary imprint) after the toner of a color with which this inventions differ on a middle imprint object in the target image formation method laps, on a middle imprint object, each color toner is imprinted one by one from an image support (primary imprint). In this case, the fault that the amount of electrifications becomes easy to rise, the imprint property of the toner at the time of a secondary imprint will change with order of a primary imprint in order to receive many charge histories on a middle imprint object, and the color tone of a color picture will differ from an original manuscript produces the toner imprinted primarily first. Such fault is canceled by this invention. Hereafter, this invention is explained in detail.

[0038] It became clear that the imprint property at the time of the secondary imprint of two or

more colors regularity—izes by the color, and the color picture of the stable color tone is obtained by making the amount of electrifications of the developer to be used high in order of development as a result of this invention persons' examination. Moreover, the absolute value of the amount of electrifications of a developer is desirable, in order that considering as 10–30microc/g may be stabilized and it may acquire an imprint property.

[0039] Furthermore, in order to attain the purpose of this invention, it is necessary to give a suitable fluidity, and as for the degree of condensation, to the toner used for this invention, it is desirable that it is 5 – 25%. When the degree of condensation is less than 5%, the dust of the toner at the time of an imprint may be generated, and, in an adult case, worm—eaten may occur rather than 25% at the time of an imprint.

[0040] Measurement of the degree of condensation of a toner can be performed by the following methods. That is, using a powder circuit tester (Hosokawa Micron CORP. make), a screen (75 micrometers of openings, 45 micrometers, and 22 micrometers) is arranged in this order from a top, a 2g toner is supplied to the screen of 75 micrometers of openings, vibration is given for 30 seconds with the amplitude of 1mm, the weight of 0.5, and 0.3 and 0.1 is applied and added to each measurement, and the toner weight of each plus sieve after vibration is computed by percentage.

[0041] Moreover, it is effective in order that a hydrophobic silica may attain the purpose of this invention as an additive mixed especially to a toner. A hydrophobic silica usually shows the thing of the 50% or more of the degrees of hydrophobing here. The degree of hydrophobing of a silica impalpable powder is controllable by carrying out surface treatment (hydrophobing processing) of the front face of a silica impalpable powder with a silane system compound. That is, a silane compound is made to react to the hydroxyl group combined with the silica impalpable powder, and it can control by replacing a hydroxyl group by the siloxyl machine etc. Therefore, the degree of hydrophobing is the rate of the hydroxyl group which disappeared by the above—mentioned reaction among the hydroxyl groups which existed before hydrophobing. Hydrophobing processing is performed by making a dialkyl dihalogen—ized silane, a trialkyl halogenation silane, hexa alkyl disilazane, an ARUKIRUTORI halogenation silane, etc. react to a silica impalpable powder under an elevated temperature.

[0042] Moreover, the degree of hydrophobing of the aforementioned silica impalpable powder can be measured by the following method. That is, 50ml of water is put into a 200ml beaker, and a 0.2 moreg silica impalpable powder is added. and ml of the dropping methanol when the silica impalpable powder which adds a methanol and is appearing from the buret with which the nose of cam was immersed underwater beginning to sink, and sinking completely at the time of dropping, agitating gently by the magentic stirrer, — reading — degree of hydrophobing = [— ml of a dropping methanol — a number — / (ml of 50+ dropping methanol number)] x 100 (%) since — it asks The degree of hydrophobing of a silica impalpable powder is so high that the value of the degree of hydrophobing is large since the silica impalpable powder which carried out the role of a surfactant in this case, and has floated with dropping of a methanol distributes a methanol underwater through a methanol. Moreover, 0.1–2.0 weight section addition of the content of the hydrophobic silica used for this invention is carried out to the toner particle 100 weight section. Moreover, it is a 0.3 – 1.5 weight section grade especially preferably.

[0043] Furthermore, it became clear to phenomena, such as worm—eaten [ at the time of the above—mentioned imprint ], and dust of a toner, that the direction with little coating weight per unit area of the toner developed is advantageous as a result of this invention persons' examination.

[0044] That is, although a toner is further transferred to imprint material, when there is much coating weight of a toner, condensation of toners is promoted by the consolidation of a toner by the press at the time of an imprint, and it is easy to generate dust from an image support, without [ a middle imprint object and ] becoming easy to generate worm—eaten and being able to perform transition of a still more faithful toner.

[0045] Moreover, although it is generally desirable for high-definition-izing to diameter[ of a granule ]-ize a toner, it becomes easy to generate the aforementioned worm-eaten phenomenon by diameter[ of a granule ]-izing. Therefore, although it is desirable to lessen development coating weight of a toner further, picture concentration runs short in this case, and a high-definition picture is no longer acquired.

[0046] Therefore, it is necessary to raise the degree of coloring of a toner. On the other hand, when there is too little coating weight of a toner, the feeling of ZARATSUKI of a picture comes to be conspicuous. As for the degree of coloring of these points to a toner, being referred to as 2.2-2.8 is desirable.

[0047] The degree of coloring of a toner was measured as follows here. That is, toner 1 mg/cm<sup>2</sup> was made to adhere to a transfer paper (the Ricoh make, Types 6000 and 70W), the fixing equipment of the Ricoh pulley tail 550 was passed, and picture concentration was measured for the fixing picture with the 938 SUPEKUTORO densitometer made from X-Rite. Moreover, as for the volume mean particle diameter of the toner used for this invention, it is desirable to be referred to as 4-9 micrometers. While the feeling of ZARATSUKI of a picture is lost by being referred to as 9 micrometers or less, a picture with high resolution is acquired. Moreover, in the case of less than 4 micrometers, worm-eaten [ at the time of an imprint ] may occur.

[0048] Hereafter, the toner and developer which are used for this invention are explained in detail. As a binder resin used in the toner used by this invention, all the things used as a binding resin for toners from the former are applied. Specifically Styrene, such as polystyrene, poly p-chloro styrene, and polyvinyl toluene, and the polymer; styrene-p-chloro styrene copolymer of the substitution product, A styrene-propylene copolymer, a styrene-vinyltoluene copolymer, A styrene-vinyl naphthalene copolymer, a styrene-methyl-acrylate copolymer, A styrene-ethyl-acrylate copolymer, a styrene-butyl-acrylate copolymer, A styrene-acrylic-acid octyl copolymer, a styrene-methyl-methacrylate copolymer, A styrene-ethyl-methacrylate copolymer, a styrene-methacrylic-acid butyl copolymer, A styrene-alpha-crawl methyl-methacrylate copolymer, a styrene acrylonitrile copolymer, A styrene-vinyl methyl-ether copolymer, a styrene-vinyl ethyl ether copolymer, A styrene-vinyl methyl ketone copolymer, a styrene-butadiene copolymer, A styrene-isoprene copolymer, a styrene-acrylonitrile-indene copolymer, Styrene system copolymers, such as a styrene-maleic-acid copolymer and a styrene-maleate copolymer; A polymethylmethacrylate, Poly butyl methacrylate, a polyvinyl chloride, polyvinyl acetate, polyethylene, Polypropylene, polyester, a polyvinyl butyl butyral, a polyacrylic resin, These are independent, or rosin, denaturation rosin, a terpene resin, phenol resin, aliphatic series or an alicycle group hydrocarbon resin, an aromatic system petroleum resin, chlorinated paraffin, paraffin wax, etc. are mentioned, and they are used by two or more sorts, mixing. In these, especially desirable things are a polyol resin, polyester, and an epoxy resin in this invention.

[0049] In the toner of this invention, in order to give suitable electrification for a toner, it is desirable to make an electrification control agent contain. As an electrification control agent in this case, the matter of a white system is added from the transparent plane color which does not spoil the color tone of a color toner, and what can carry out stabilization grant of the toner electrification nature is desirable to negative polarity or straight polarity. Specifically, as a thing of straight polarity, quarternary ammonium salt, an imidazole metal complex, salts, etc. are used, and a salicylic-acid metal complex, salts, organic boron salts, a calyx allene system compound, etc. are used as a thing of negative polarity.

[0050] Moreover, the stain pigment as a coloring agent which can obtain the toner of yellow, a Magenta, cyanogen, and a black color can be used. for example, independent in any conventionally well-known stain pigments, such as stain pigments, such as carbon black, lamp black, ultramarine blue, the aniline bule, a copper phthalocyanine blue, a Phthalocyanine Green, Hansa yellow G, rhodamine 6G, a lake, a KARUKO oil blue, chrome yellow, a Quinacridone, a benzidine yellow, a rose bengal, and a triaryl methane system color, -- or it can be used, mixing

The amount of these coloring agents used is usually 3 – 20 % of the weight preferably one to 30% of the weight to a binding resin.

[0051] Moreover, it is possible to add hydrophobic titanium oxide, a hydrophobic alumina, etc. in order to raise the fluidity other than the hydrophobic silica shown in this invention as an external additive added to a toner. In addition, you may add fatty-acid metal salts (a zinc stearate, aluminum stearate, etc.), a polyvinylidene fluoride, etc. if needed.

[0052] Moreover, it is possible to give electrification to a toner, to mix with a carrier in order to convey a toner in a development unit, and to use it as a two component developer. That by which iron powder with a particle size of about 20–200 micrometers, nickel powder, ferrite powder, the glass bead, etc. coated the front face with the mixture of these resins, such as a styrene-acrylic-ester copolymer, a styrene-methacrylic-ester copolymer, an acrylic-ester polymer, a methacrylic-ester polymer, silicone resin, polyamide resin, an ionomer resin, and polyphenylene sulfide resin, by making these into a core material as a carrier again is used.

[0053]

[Embodiments of the Invention] Hereafter, this invention shoots based on drawing 4, and the example of the image formation method and the example of equipment are further explained to a detail. In the equipment of drawing 4, the color picture data from the color scanner which is not illustrated are changed into a lightwave signal, and an electrostatic latent image is formed in a photo conductor (9) of the write-in optical unit which performs the optical writing corresponding to the manuscript picture and which is not illustrated. This optical unit is well-known in itself, and consists of a laser diode, a polygon mirror, a polygon motor, an image formation lens, a reflective mirror, etc. a photo conductor (9) -- an arrow -- like -- a counterclockwise rotation -- rotating -- although -- The cleaning unit which contains a front [ cleaning ] electric discharge machine, a KUNNINGU roller, and a cleaning blade (10-3) in the surroundings of it (10), electric discharge -- a lamp -- (-- 11 --) -- electrification -- a vessel -- (-- 12 --) -- potential -- a sensor -- (-- 13 --) -- Bk -- a development counter -- (-- 14 --) -- C -- a development counter -- (-- 15 --) -- M -- a development counter -- (-- 16 --) -- Y -- a development counter -- (-- 17 --) -- development -- concentration -- a pattern -- a detector -- (-- 18 --) -- middle -- an imprint -- a belt Each development counter (14) - (17) consists of a development paddle which rotates in order to pump up and agitate development - (17-1) and the sleeve (14-1) which are rotated so that a developer may be made to counter a photo conductor (9), in order to develop an electrostatic latent image, and a developer, a toner concentration detection sensor of a developer, etc. Here, the example which set sequence (color toner formation sequence) of development operation to Bk, C, M, and Y explains operation below (however, sequence is not restricted to this).

[0054] If copy operation understands and is carried out, the read of Bk image data will start from timing predetermined with the color scanner which is not illustrated, and the optical writing by the laser beam and latent-image formation will start based on this image data (Bk latent image is called hereafter). Suppose that it is the same also about C, M, and Y. That development should be made possible from the point of this Bk latent image, before a latent-image point arrives at the development position of Bk development counter (14), the rotation start of the development sleeve (14-1) is carried out, and Bk latent image is developed with Bk toner (the amount of electrifications is held to the minimum). Then, although development operation of Bk latent-image field is continued, when Bk latent-image back end section passes through Bk development position, it changes into a development non-operative state. This is made to complete at least before the following C picture point reaches.

[0055] Subsequently, Bk toner image formed on the photo conductor (9) is imprinted on the front face of the middle imprint belt (19) by which the uniform drive is carried out with the photo conductor (9) (the toner image imprint to a middle imprint belt (19) from a photo conductor (9) is hereafter called "primary imprint"). A primary imprint is performed by impressing imprint bias voltage in the state where the photo conductor (9) and the middle imprint belt (19) contacted.

And the toner image of Bk, C, M, and Y which are formed in a middle imprint belt (19) one by one at a photo conductor (9) is aligned one by one to the same side, the primary transfer picture of 4 color piles is formed, and a package imprint (secondary imprint) is performed to a transfer paper after that. About the unit configuration of this middle imprint belt (19), and operation, it mentions later.

[0056] Although it progresses after Bk process in a photo conductor (9) side at C process which used C toner which next held the amount of electrifications small, C picture read by the color scanner begins from predetermined timing, and C latent-image formation is performed in the laser beam writing by the image data. After previous Bk latent-image back end section passed to the development position, and before the nose of cam of C latent image reaches, C development counter (15) carries out the rotation start of the development sleeve (15-1), and develops C latent image with C toner which held the amount of electrifications small to the 2nd. Although the development of C latent-image field is continued after that, when the latent-image back end section passes, it changes into a development non-actuation state like the case of previous Bk development counter. a mist [ this ] beam -- it is made to complete before the following M latent-image point reaches About the process of M and Y, since the amount of electrifications uses the toner held greatly one by one and also operation of each image data read, latent-image formation, and development is the same as that of the process of above-mentioned Bk and C, explanation is omitted.

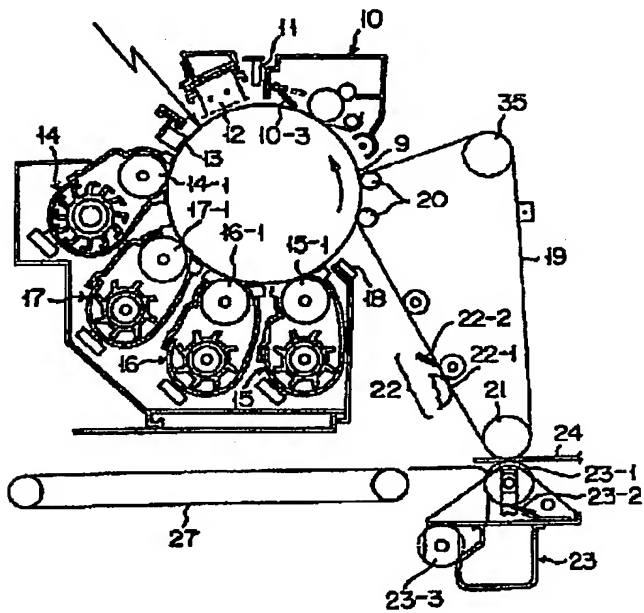
[0057] The middle imprint belt (19) is constructed over the imprint bias roller (20), the drive roller (21), and the follower roller (35), and drive control is carried out from the drive motor 2 which is not illustrated. A belt cleaning unit (22) is constituted by the brush roller (22-1) which the abbreviation half has exposed, rubber blade (22-2) \*\*, etc., and carries out attachment-and-detachment operation according to the attachment-and-detachment mechanism which is not illustrated. The timing of this attachment-and-detachment operation is made to desert a middle imprint belt (19) side until the primary imprint of Y (this example four amorous glance of the last color) is completed from a print start, is subsequent predetermined timing and cleans by making a middle imprint belt (19) side contact according to the aforementioned attachment-and-detachment mechanism.

[0058] A paper imprint unit (23) is a paper imprint bias roller (23-1).

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[Translation done.]

Drawing selection [Representative drawing] 



[Translation done.]

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**JAPANESE** [JP,10-207164,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS  
DRAWINGS

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[Translation done.]



## \* NOTICES \*

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

## EXAMPLE

[Example] Hereafter, an example explains this invention to a detail further.

Example 1 <a black toner> Binding resin (polyol resin : softening temperature of 105 degrees C) The 100 weight sections Electrification control agent (fluorine-containing quarternary-ammonium-salt compound) The 0.8 weight sections Coloring agent (carbon black) After mixing enough with a blender, melting kneading of the 7 weight sections was carried out with 2 rolls which heated at 100-110 degrees C. Coarse grinding of the kneading object was carried out by the cutter mill after natural radiational cooling, the pulverizer using the jet stream removed fines after pulverization using pneumatic elutriation equipment, and the parent coloring particle was obtained. Furthermore, to this parent coloring particle 100 weight section, the hydrophobic titanium oxide 0.8 weight section of the 60% of the degrees of hydrophobing was mixed in the Henschel mixer, and the toner was obtained. Moreover, it mixed with the turbular mixer at a rate of 5 weight sections to the carrier 100 weight section which carried out the surface coat of the silicone resin to the ferrite particle of 50 micrometers of mean particle diameters, and this toner was made into the developer. In addition, the volume mean particle diameter of the obtained toner was [ 2.0 and the degree of condensation of 9.2 micrometers and the degree of coloring ] 26, and the amount of electrifications of a developer was -16microc/g. Moreover, about cyanogen, the Magenta, and the yellow toner, the toner was created on the same conditions as a black toner in the following composition conditions, and the developer was acted similarly.

[0060]

[Table 1]

	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点 105℃ 100重量部		
帯電制御剤	含フッ素四級アンモニウム塩化合物 (0.9重量部) (1.0重量部) (1.2重量部)		
着色剤	銅フタロシアニン ブルー顔料 (C.I.Pigment Blue 15) (2.0重量部)	キナクリドン系顔料 (C.I.Pigment Red 122) (4.0重量部)	ジスアゾ系顔料 (C.I.Pigment Yellow 17) (4.5重量部)
外添加剤	疎水性酸化チタン (疎水化度 60%) (0.8重量部) (0.8重量部) (0.8重量部)		

The property of the obtained toner and a developer is shown in Table 7. Moreover, the good result was obtained, when set to the Ricoh pulley tail 550 the toner and developer which were

obtained, negatives were developed in order of black, cyanogen, a Magenta, and yellow, imprint nature (toner dust and worm-eaten) in the character section at the time of 4 color piles was evaluated and evaluation of the ZARATSUKI nature of the solid section and picture concentration was performed further. In addition, the method of evaluation was enforced as follows.

[0061] Worm-eaten rank rank 5 at the time of an imprint It is completely the non-generated rank 4. Rank 3 which worm-eaten [ 1-2 ] can check with a magnifier although it cannot check visually Rank 2 which worm-eaten [ several ] can check with a magnifier although it can hardly check visually Rank 1 which can check worm-eaten visually That most characters have fallen out can check visually. [0062] Rank rank 5 of the imprint dust at the time of an imprint It is completely the non-generated rank 4. Rank 3 which can check few dust with a magnifier although it cannot check visually Rank 2 which several dust can check with a magnifier although it can hardly check visually Rank 1 which dust can check visually BOYAKE of the character by dust can check visually (one 10 times the scale factor [ Magnifier : ] of this).

[0063] ZARATSUKI nature rank rank 5 Uniform solid picture rank 4 Rank 3 which the nonuniformity of a picture can check slightly with a magnifier visually although it is uniform Rank 2 which can be checked with a magnifier although ZARATSUKI can hardly be checked visually Rank 1 which can check ZARATSUKI of a picture visually Monochromatic concentration is measured with the level picture concentration Macbeth reflection density meter (made in Macbeth) which ZARATSUKI of a picture is severe and cannot say as a solid picture.

[0064] Example 2 [0065]

[Table 2]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点 110℃ 100重量部			
帯電制御剤	サリチル酸誘導体亜鉛塩			
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(7.2重量部)	(2.0重量部)	(3.8重量部)	(4.5重量部)
外添加剤	疎水性シリカ（疎水化度70%）			
	(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0066] Example 3 [0067]

[Table 3]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点110℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物 / サリチル酸誘導体亜鉛塩			
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.2重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.0重量部)
外添加剤	疎水性シリカ（疎水化度80%）			
	(0.5重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0068] Example 4 [0069]

[Table 4]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点98℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩／サリチル酸誘導体亜鉛塩			
	(1.0/0.5重量部)	(0.8/0.7重量部)	(0.6/0.8重量部)	(0.4/0.9重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(5.8重量部)
外添加剤	疎水性シリカ（疎水化度80%）			
	(0.6重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0070] The example 1 of comparison [0071]

[Table 5]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点105℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物			
	(1.2重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.2重量部)
外添加剤	疎水性酸化チタン（疎水化度20%）			
	(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0072] The example 2 of comparison [0073]

[Table 6]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点105℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物			
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
着色剤	カーボンブラック	銅フタロシアニンブルー (C.I.Pigment Blue 15)	キナクリドン系顔料 (C.I.Pigment Red 122)	アゾ系顔料 (C.I.Pigment Yellow 180)
	(1.2重量部)	(5.0重量部)	(9.0重量部)	(9.0重量部)
外添加剤	疎水性シリカ（疎水化度30%）			
	(0.8重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部)


The toner was created on the same conditions as \*\* and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

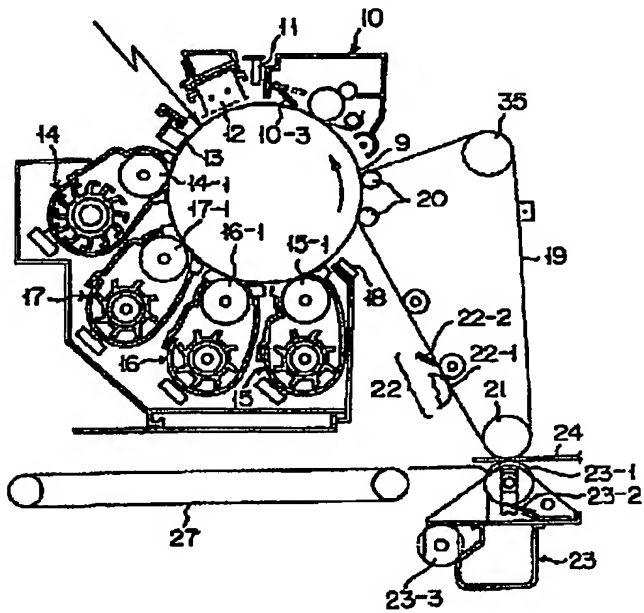
[0074]

[Table 7]

	トナー色 現像順↓	カラー・特性				現像剤				西條品質評価結果			
		結着剤類	帯電剤類	外添加剤	添加量 (質量部)	体積平均 粒径(μm)	体積平均 粒径(μm)	凝集度	現像剤 付着率 (wt%)	現像剤 付着率 (μm)	現像剤 付着率 (μm)	現像剤 付着率 (μm)	現像剤 付着率 (μm)
実例1	ブラック	ポリマー 樹脂	含有素4級 アモニウム塩(A)	0.8疎水性	0.8	9.2	2.0	26	5.0	4	4	5	1.7
	シアン			0.9酸性化ガ	0.8	8.9	2.0	27	5.0				1.8
	マゼンタ			1.0	0.8	9.2	2.1	28	5.0				1.9
	イエロー			1.2	0.8	9.3	1.9	27	5.1				2.0
実例2	ブラック	ポリマー 樹脂	含有素4級 アモニウム塩(B)	1.0疎水性	0.7	9.3	2.1	18	5.1	4.5	4.5	4.5	1.8
	シアン			1.0	0.7	9.2	1.9	16	4.9				1.9
	マゼンタ			1.0	0.7	9.4	1.8	15	5.0				1.8
	イエロー			1.0	0.7	9.5	1.9	14	4.9				2.0
実例3	ブラック	ポリマー 樹脂	含有素4級 アモニウム塩(A)	1.0疎水性	0.5	8.1	2.4	23	4.8	5	5	5	2.2
	シアン			1.0	0.6	8.0	2.3	20	5.1				2.2
	マゼンタ			1.0	0.7	8.3	2.4	18	5.0				2.2
	イエロー			1.2	0.7	7.9	2.5	18	5.1				2.3
実例4	ブラック	ポリマー 樹脂	含有素4級 アモニウム塩(A)/(B)	1.0/0.5疎水性	0.6	5.8	2.4	20	5.0	5	5	5	2.2
	シアン			0.8/0.7	0.6	5.5	2.2	20	5.1				2.2
	マゼンタ			0.6/0.8	0.7	5.3	2.3	18	4.9				2.2
	イエロー			0.4/0.9	0.7	5.4	2.3	19	4.9				2.2
比較例1	ブラック	ポリマー 樹脂	含有素4級 アモニウム塩(A)	1.2疎水性	0.7	6.2	2.3	33	5.5	2	2	5	2.2
	シアン			0.8酸性化ガ	0.7	6.5	2.3	34	5.5				2.3
	マゼンタ			0.8	0.7	6.8	2.3	33	5.4				2.2
	イエロー			0.8	0.7	6.4	2.3	35	5.6				2.2
比較例2	ブラック	ポリマー 樹脂	含有素4級 アモニウム塩(A)	1.0疎水性	0.8	9.2	3.0	16	5.0	4	4	2	2.5
	シアン			1.0	0.8	9.1	3.1	15	5.0				2.4
	マゼンタ			1.0	0.8	9.4	3.0	16	4.9				2.4
	イエロー			1.0	0.8	9.5	3.1	15	5.0				2.5

[Translation done.]

Drawing selection [Representativ drawing] 



[Translation done.]

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JAPANESE

[JP,10-207164,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS  
DRAWINGS

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[Translation done.]



**\* NOTICES \***

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] It is drawing showing the example of a picture of the shape of worm-eaten [ which is generated in the conventional image formation method ].

[Drawing 2] It is drawing explaining picture generating of the shape of high surface roughness and worm-eaten in the conventional image formation method.

[Drawing 3] It is drawing explaining picture \*\*\*\*\* of the shape of worm-eaten [ in the conventional image formation method ].

[Drawing 4] It is drawing explaining the example of image formation equipment and the example of a method of this invention.

**[Description of Notations]**

w Worm-eaten

I Electrode

II Electrode

II-1 Electrode heights

II-2 Electrode crevice

Gp Air gap

T Toner

9 Photo Conductor (Image Support)

10 Photo Conductor Cleaning Unit

10-1 Front [ Cleaning ] \*\*\*\*\*

10-2 Brush Roller

10-3 Rubber Blade

11 Electric Discharge Lamp

12 Electrification Machine

13 Potential Sensor

14 Bk Development Counter

14-1 Development Sleeve

15 C Development Counter

15-1 Development Sleeve

16 M Development Counter

16-1 Development Sleeve

17 Y Development Counter

17-1 Development Sleeve

18 Development Concentration Pattern Detector

19 Middle Imprint Belt

20 Imprint Bias Roller


21 Drive Roller

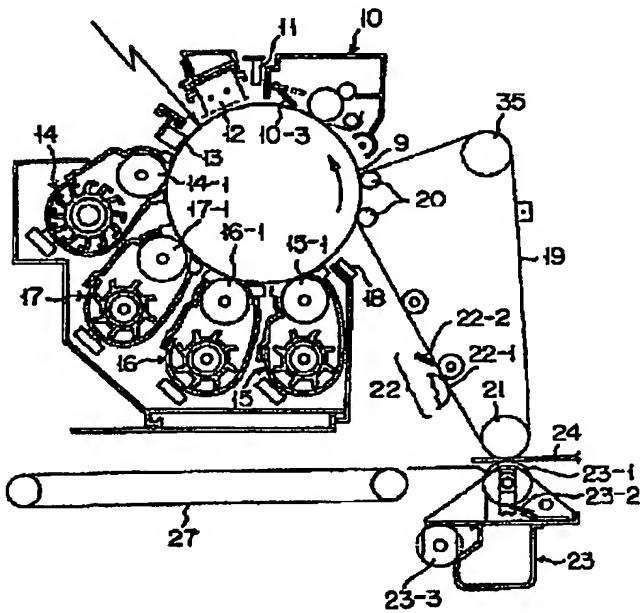
22 Belt Cleaning Unit

- 22-1 Brush Roller
- 22-2 Rubber Blade
- . 23 Paper Imprint Unit
  - 23-1 Paper Imprint Bias Roller
  - 23-2 Roller Cleaning Blade
  - 23-3 Attachment-and-Detachment Mechanism
- 24 Transfer Paper
- 27 Conveyance Belt
- 35 Follower Roller

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[Translation done.]

Drawing selection [R presentative drawing] 



[Translation done.]

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**JAPANESE** [JP,10-207164,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS  
DRAWINGS

---

[Translation done.]

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3.In the drawings, any words are not translated.

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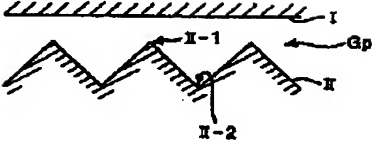
DRAWINGS

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[Drawing 1]



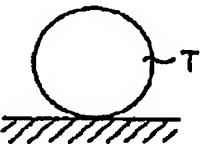
[Drawing 2]



[Drawing 3]

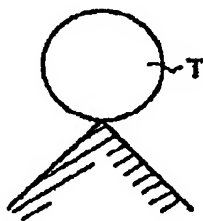
(a)

平面接触



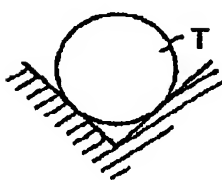
(b)

凸部接触



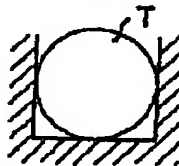
(c)

凹部接触 I

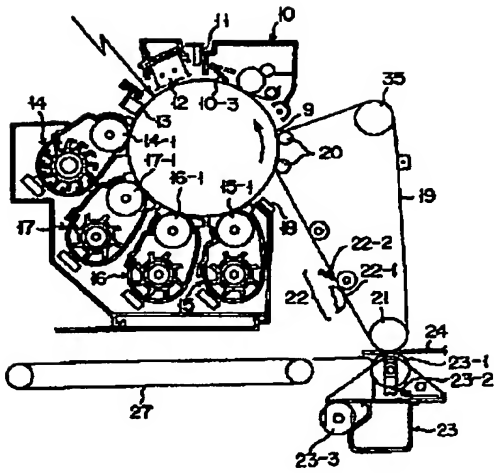


(d)

凹部接触 II

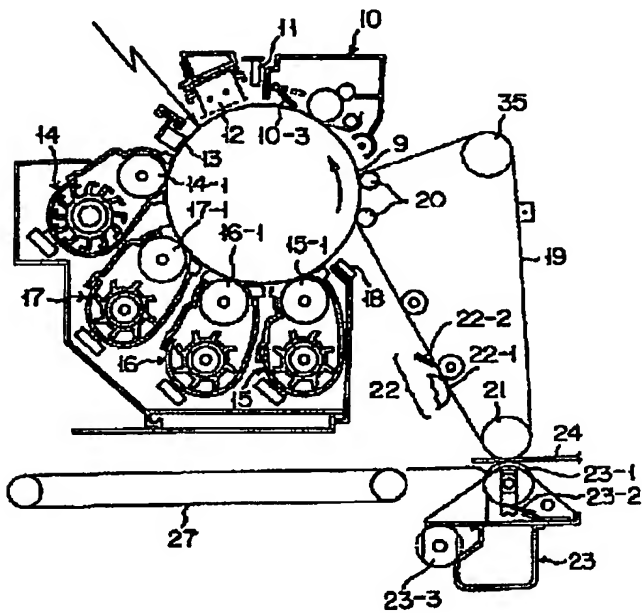


[Drawing 4]



[Translation done.]

Drawing selection [Representativ drawing] 



[Translation done.]



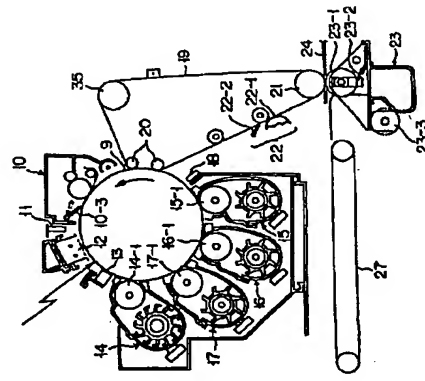
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(51) Int. Cl. <sup>7</sup>	G 03 G 15/01	識別記号	F I	G 03 G 15/01	J
(52) 出願日	平成9年(1997) 1月22日	114	9/08	9/08	114A
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(21) 出願番号	特願平9-23188	(71) 出願人	00000747
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(54) 発明の名称 中間転写方式を用いた画像形成方法

(57) 要約  
【課題】 中間転写方式を用いた画像形成方法において、転写時に発生する局所的な転写不良(虫喰い)や、トナーのチリによる画像の再現性不良を防止すること。  
【解決手段】 像担持体上のトナー像を無端状の中間転写体に一次転写する工程を複数回繰り返して重ね転写画像を形成し、この中間転写体上の重ね転写画像を一括して転写材上に二次転写するようにした中間転写方式を用いた画像形成方法において、少なくとも、ブラック、シアン、マゼンタ、イエロー色からなるトナーを、像担持体上に順次現像する際に、用いる現像剤の帯電量を高く保持し、かつ用いられる現像剤の帯電量の絶対値を10〜30μc/gとすることを特徴とする画像形成方法。



【特許請求の範囲】

【請求項1】 像担持体上のトナー像を無端状の中間転写体に一次転写する工程を複数回繰り返して重ね転写画像を形成し、この中間転写体上の重ね転写画像を一括して転写材上に二次転写するようにした中間転写方式を用いた画像形成方法において、少なくとも、ブラック、シアン、マゼンタ、イエロー色からなるトナーを、像担持体上に順次現像する際に、用いる現像剤の帯電量を高く保持し、かつ用いられる現像剤の帯電量の絶対値を10〜30μc/gとすることを特徴とする画像形成方法。

【請求項2】 前記用いられるトナーが、少なくとも線水性シリカを含有し、帯電量が5〜25%であることを特徴とする請求項1記載の画像形成方法。

【請求項3】 前記用いられるトナーの着色度が2.2〜2.8であり、かつ該トナーの体積平均粒径が4〜9μmであることを特徴とする請求項1記載の中間転写方式を用いた画像形成方法。

【発明の詳細な説明】

【0001】  
【発明の属する技術分野】 本発明は、複写機、プリンタ等、フロッピーディスクなどの電子方式を用いた画像形成方法及び画像形成装置に関し、詳しくは、中間転写体等の中間転写体を介在させて、像担持体から中間転写体へトナー像を転写する一次転写、中間転写体上の一次転写画像を転写材へ転写する二次転写の各転写工程を逐次行い画像形成を行う画像形成方法及び画像形成装置に関する。

【0002】

【従来の技術】 像担持体、例えば感光体上に順次形成される複数の可視の色情現像画像を無端状に進行する中間転写体、例えば中間転写ベルト上に順次重ね合わせて一次転写し、この中間転写体上の一次転写画像を転写材に一括して二次転写する中間転写方式の画像形成方法及び装置が知られている。とりわけ、中間転写方式は、色分解された原稿画像をブラック、シアン、マゼンタ、イエローなどのトナーによる減色混合を用いて再現するいわゆるフルカラー画像形成装置において各色トナー像を重ね転写方式として採用されている。

【0003】 このような画像形成方法及び装置において、色情現像画像を構成するトナーの一次転写時及び二次転写時における局所的な転写抜けに起因して、最終的な画像媒体である転写紙等による転写材上の画像中に、局所的に全くトナーが転写されず、所謂虫喰い状の部分を生ずることがある。このような虫喰い状の画像の例を図1に示す。虫喰い状の画像は、面押画像の場合には図1に符号(w)で示すように、ある面積を以って転写抜けとなることにより発生する他、ライン画像の場合には、ラインが途切れるように転写抜けを生ずることにより発生する。かかる異常画像をなくするには、転写抜けが発生しないようにすることであり、つまり、転写性を向上

(2)

2

させればよく、そのための技術として、以下に述べるような技術が提案されている。  
【0004】 転写性を向上させるための既存の技術は、次の5つに分類できる。

(1) 中間転写体の表面粗度低減に関する技術

a. 中間転写体にエラストマーを使用し、かつ、中間転写体の表面粗度を規定することで、中間転写体と転写材との密着性を向上させて、転写性を向上、虫喰い状の発生防止をはかるもの(特開平3-242667号公報)、および、b. 中間転写体の表面粗度を規定し、転写性向上、虫喰い状の発生防止をはかるもの(特開平63-194272号公報、特開平4-303869号公報、特開平4-303872号公報、特開平5-193020号公報)がある。

【0005】 これら(1)の範疇に属する従来技術は、一次転写工程における像担持体と中間転写体間、二次転写工程における中間転写体と転写材間、でのトナー転写に関するもので、放電現象をともなうともいえる。ここで、中間転写体表面が極端な凹凸状の表面粗度であるとすると、凸部上と凹部上でのトナーに対する転写電界は、

凸部転写電界>凹部転写電界

となり、凸部転写電界が相対的に大きくなる。  
【0006】 その理由は、次のように説明できる。すなわち、図2を参照すると、平坦な表面を有する電極

(1)と、この電極(1)に微小なエアギャップ(G)を介して対面する傾斜状の表面を有する電極(11)を想定したとき、像担持体と中間転写体間、中間転写体と転写材間などの転写媒体間のトナー転写電界は、これら転写媒体間のエアギャップ電界として、

一次転写電界...像担持体/中間転写体間のエアギャップ電界  
二次転写電界...中間転写体/転写材間のエアギャップ電界

で説明できる。

【0007】 図2において、凸部を(11-1)、凹部を(11-2)とすると、電極(1)、電極(11)に転写ベイス電圧が印加された場合、これら電極間の距離が異なる凹部(11-2)に比較し、距離が短い凸部(11-1)に放電が集中する。つまり、

凸部エアギャップ電界>凹部エアギャップ電界  
となる。同様理由により、中間転写体の表面粗度が大きい場合の凸部、凹部のエアギャップ電界は、凸部転写電界>凹部転写電界となる。

【0008】 このようなことから、凸部、凹部両者のトナー形状を同一とみなした場合、凹部におけるトナーに比較して凸部におけるトナーの方が大きい電界中に位置するので、大きな静電的力を受けて転写されやすくなり、つまり、凸部に比較して、凹部は転写されにくいと

50



微粉末が沈み始め、完全に沈んだ時の滴下メタノールの量を観み、  
疎水化度＝(滴下メタノールのml数)/(50±滴下メタノールのml数)×100 (%)  
から求められる。メタノールはこの場合界面活性剤の役割をし、メタノールの滴下に伴って得られているシリカ微粉末がメタノールを介して水中に分散化している。疎水化度の値が大きいほどシリカ微粉末の疎水化度は高い。また、本発明に用いる疎水性シリカの含有量は、トナー粒子100重量部に対し、0.1～2.0重量部添加される。また、特に好ましくは0.3～1.5重量部程度である。

【00443】さらに、本発明者らが検討した結果、前述の転写時の虫喰いやトナーのチリといった現象に対し、現象されるトナーの単位面積当たりの付着量が少ない方が有利であることが明らかとなった。

【00444】つまり、像担持体から中間転写体、更には転写ヘッドトナーへ転移するが、トナーの付着量が多い場合には転写時の押圧によりトナーの圧密によってトナー同士の凝集が促進され、虫喰いが発生しやすくなり、更に虫喰ったトナーの転移ができずにチリが発生しやすい。

【00445】また、一般的に高面質化のために、トナーを小粒径化することが好ましいが、小粒径化することにより前記の虫喰い現象が発生しやすくなる。したがって、トナーの現像付着量を更に少なくすることが好ましいが、この場合に、画像濃度が不足し、高品位の画像が得られなくなる。

【00446】そのために、トナーの着色度は向上させる必要がある。その一方で、トナーの付着量が少なくなる場合には、画像のザラツキ感が目立つようになる。これらの点からトナーの着色度は、2.2～2.8とすることが好ましい。

【00447】ここでトナーの着色度は、次のように測定した。即ち、転写紙(リコー製、タイプ6000、70W)にトナー1mg/cm<sup>2</sup>を付着させ、リコー製ブリテール550の定着装置に通過後、定着画像をX-Rite社製の938スベクトロデンシトメーターにて画像濃度を測定した。また、本発明に用いるトナーの体積平均粒径は、4～9μmとすることが好ましい。9μm以下とすることで画像のザラツキ感がなくなると共に、解像力の高い画像が得られる。また、4μm未満の場合には、転写時の虫喰いが発生する場合がある。

【00448】以下、本発明に用いられるトナー及び現像剤について詳細に説明する。本発明で用いるトナーにおいて使用されるバインダー樹脂としては、従来からトナー用粘着樹脂として使用されてきたものが全て適用される。具体的には、ポリスチレン、ポリpクロロスチレン、ポリビニルトルエンなどのスチレン及びその重合体の重合体；スチレン-パークロロスチレン重合体、スチレン-プロピレン重合体、スチレン-ビニルトルエン

は、中間転写体上に異なる色のトナーを重ねた後、転写材上に一度に転写(二次転写)する工程を経るが、像担持体から中間転写体上へは各色トナーが順次転写(一次転写)される。この場合、最初に一次転写されたトナーは中間転写体上でチャージャー問題を多く受けるため帯電量が上昇しやすくなり、二次転写時のトナーの転写特性が一次転写の順により異なり、カラー画像の色調がオリジナル原稿と異なってしまうという不具合が生じる。このような不具合は本発明により解消される。以下、本発明を詳細に説明する。

【0033】本発明者らが検討した結果、用いる現像剤の帯電量を現像剤に高くすることにより、複色の二次転写時の転写特性が色によって一定化し、安定した色調のカラー画像が得られることが明らかとなった。また、現像剤の付着量の絶対値は10～30μc/gとすることが転写特性を安定して得るために好ましい。

【0039】さらに、本発明に用いるトナーには、本発明の目的を達成するため、適切な流動性を付与する必要がある。流動性は5～25%であることが好ましい。流動度が5%未満の場合には、転写時のトナーのチリが発生する場合があり、25%より大の場合には、転写時に虫喰いが発生する場合がある。

【0040】トナーの流動度の測定は、次のような方法により行うことができる。すなわち、バグダー-スター(ボカワミクロン社製)を用い、目開き75μm、45μm及び22μmの篩をこの順に上から振ふる。目開き75μmの篩に2gのトナーを投入して、振揺1mmで30秒間振揺を与え、振揺後篩上のトナー重量を測定。それぞれに0.5、0.3及び0.1の重みをかけ、加算して百分率で算出する。

【0041】また、特にトナーに混合する添加剤として、疎水性のシリカが本発明の目的を達成するため効果的である。ここで疎水性のシリカとは通常疎水化度50%以上のものを示す。シリカ微粉末の疎水化度は、シリカ微粉末の表面をシラン系化合物で表面処理(疎水化処理)することでコントロールできる。即ち、シリカ微粉末に結合している水酸基にシラン化合物を反応させ、水酸基をシロキシル基等に置換することによりコントロールできる。したがって、疎水化度とは疎水化前に存在した水酸基のうち上記反応により消失した水酸基の割合である。疎水化処理はシリカ微粉末にジアルキルハロゲン化シラン、トリアルキルハロゲン化シラン、ヘキサアルキルジシラン、アルキルトリハロゲン化シラン等を高温下で反応させることにより行われる。

【0042】また、前記シリカ微粉末の疎水化度は、次の方法により測定することができる。即ち、200mlのビーカーに水50mlを入れ、更に0.2gのシリカ微粉末を添加する。そして、マグネティックスターラーでゆするやがに攪拌しつつ、滴下時に先端が水中に浸漬されたビュレットからメタノールを加え、浮かんでいるシリカ

らかである。  
【0034】また、用いられるトナーについて注目するところ、虫喰い画像を防止するために、トナーの流動性を向上させて転写時の移動性をアップさせる方法や、トナーに樹脂粒子等を添加して転写時の押圧によるトナー同士との圧密を防止する方法が知られている。しかしながら、トナーの流動性を向上しすぎた場合には、転写時にトナーが散る現象が発生しやすくなり、文字等の忠実な再現ができなくなる場合がある。

【0035】  
【発明が解決しようとする課題】したがって、本発明の目的は、上記従来技術における問題点を解消し、中間転写方式を用いた画像形成方法において、転写時に発生する局所的な転写不良(虫喰い)や、トナーのチリによる画像の再現性不良を防止することにある。

【0036】

【課題を解決するための手段】上記の課題は、本発明の(1)「像担持体上のトナー像を無端状の中間転写体上に一次転写する工程を複数回繰り返して重ねた転写画像を形成し、この中間転写体上の重ねた転写画像を一括して転写材上に二次転写するようにした中間転写方式を用いた画像形成方法において、少なくとも、ブラック、シアンのマゼンタ、イエロー色からなるトナーを、像担持体上に順次現像する際に、用いる現像剤の帯電量を高く保持し、かつ用いられる現像剤の帯電量の絶対値を10～30μc/gとすることを特徴とする画像形成方法」。

(2)「前記用いられるトナーが、少なくとも疎水性シリカを含有し、凝集度が5～25%であることを特徴とする前記(1)項記載の画像形成方法」及び(3)「前記用いられるトナーの体積平均粒径が4～9μmであることを特徴とする前記(1)項記載の中間転写方式を用いた画像形成方法」によって解決され、また(4)「像担持体上のトナー像を無端状の中間転写体上に一次転写する工程を複数回繰り返して重ねた転写画像を形成し、この中間転写体上の重ねた転写画像を一括して転写材上に二次転写するようにした中間転写方式を用いた画像形成装置において、少なくとも、ブラック、シアンのマゼンタ、イエロー色からなるトナーを、像担持体上に順次現像する際に、用いる現像剤の帯電量を高く保持し、かつ用いられる現像剤の帯電量の絶対値を10～30μc/gとすることを特徴とする画像形成装置」、(5)「前記用いられるトナーが、少なくとも疎水性シリカを含有し、凝集度が5～25%であることを特徴とする前記(4)項記載の画像形成装置」及び(6)「前記用いられるトナーのトナーの着色度が2.2～2.8であり、かつ該トナーの体積平均粒径が4～9μmであることを特徴とする前記(4)項記載の中間転写方式を用いた画像形成装置」により解決される。

【0037】本発明が対象とする画像形成方法において

しており、この不具合を回避するために、上記したように、例えば、30dyn-cm以下のフック係数を有する材料で形成されたローラをベルトに当て、表面にフック係数の高いコート層を形成し、ベルト表面の表面エネルギー上昇を抑制することが述べられている。さらに、この米国特許には、ベルトの表面エネルギーを下げすぎると、逆に感光体から中間転写ベルトへの転写に不具合が発生する旨の開示がある。

【00281】我々は、後述する図1に示す中間転写ベルト(19)を用いた画像形成装置において、ポリカーボネートで材料とした中間転写ベルトを用いたところ、転写時に二次転写において、虫喰い状の画像が発生した。【00289】中間転写ベルトに潤滑剤として、ステアリン酸亜鉛を少量塗布した実験を行ったところ、二次転写の不具合は解消されたが、トナーの付着量が減少し、"かすれ"状の画像が発生し、その現像場所を確認したところ、一次転写工程にて起こっていることが判明した。【00301】フック係数の材料であるETFE(エチレン-テトラフルオロエチレン重合体)を用いた中間転写ベルトでは、初期から上記"かすれ"現象が発生した。これを従来例と照らし合わせると、中間転写ベルトの表面エネルギーが前記インジエクションプロセスによる感光体表面に付着したときに、中間転写ベルトにより感光体表面に付着しやすくなり、転写性が損なわれることによるものと考えられる。

【00311】かかる転写性能の劣化は、トナー像の一部が転写されない不具合の他に、ブラック、シアンのマゼンタ、イエローの順に中間転写体へ像を重ねる作業の際に有する装置において、黒文字部などブラックトナー単色で再現される像部として転写されたブラックトナー像が以降の工程にて、感光体へ逆に転写されてしまう不具合としても顕在化する。ちなみに、ETFEの中間転写ベルトにて初期から不具合が発生したのは、初期状態にて感光体表面と中間転写ベルト表面の表面エネルギー差が大きく異なっているためであると考えられる。

【00321】これらの不具合を回避するために、前記米国特許にかかる技術では、中間転写ベルトの表面エネルギーが低くなりすぎたときに、コンディショニングプロセスを動作させることにしている。具体的には、予め決められたコピー枚数を超えた時点で、コンディショニングプロセスを動作させる。

【00331】しかしながら、複写作業を中断させコンディショニングプロセスを動作させる不都合は明らかであり、また、中間転写ベルト表面は、常に予め決められたコピー枚数後には一定の状態でなくなるという点も明



15	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点105℃ 100重量部		
帯電制御剤	フッ素四級アンモニウム塩化合物 (0.9重量部) (1.0重量部) (1.2重量部)		
増色剤	銅フタロシアニン ブルー顔料 (C.I.Pigment Blue 15) (2.0重量部)	キナクリドン系顔料 ジスアザン系顔料 (C.I.Pigment Red 122) (4.0重量部)	ジスアザン系顔料 (C.I.Pigment Yellow 17) (4.5重量部)
外添加剤	疎水性酸化チタン (疎水化度60%) (0.8重量部) (0.9重量部) (0.8重量部)		

得られたトナー及び現像剤の特性を表7に示す。また、  
得られたトナー及び現像剤をリコー製ブリラー550  
にセットし、ブラック、シアン、マゼンタ、イエローの  
順に現像を行ない、4色重ね時の文字部における転写性  
(トナーチリ及び虫喰い)の評価を行ない、更にベタ部  
のザラツキ性及び画像濃度の評価を行なったところ、良  
好な結果を得た。なお、評価の方法は以下のとおりに実  
施した。  
【0061】転写時の虫喰いのランク  
ランク5 全く未発生  
ランク4 目視では確認できないが、ルーペで虫喰いが  
1〜2箇所確認できる  
ランク3 目視ではほとんど確認できないが、ルーペで  
虫喰いが数箇所確認できる  
ランク2 目視で虫喰いが確認できる  
ランク1 文字の大半が抜けているのが目視で確認でき  
る  
【0062】転写時の転写チリのランク  
ランク5 全く未発生  
ランク4 目視では確認できないが、ルーペで僅かのチ  
リが確認できる  
ランク3 目視ではほとんど確認できないが、ルーペで  
僅かに確認できる  
ランク2 目視で画像のザラツキが確認できる  
ランク1 画像のザラツキがひどく、ベタ画像と言えな  
いレベル  
30 画像濃度  
マクベス反射濃度計 (マクベス社製) により単色の濃度  
を測定。  
【0064】実施例2  
【0065】  
【表2】

17	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点110℃ 100重量部			
帯電制御剤	シリチル酸誘導体亜鉛塩 (1.0重量部) (1.0重量部) (1.0重量部) (1.0重量部)			
増色剤	カーボンブラック顔料 ブルー (C.I.Pigment Blue 15) (7.2重量部)	カーボンブラック顔料 シアン (C.I.Pigment Blue 15) (2.0重量部)	カーボンブラック顔料 マゼンタ (C.I.Pigment Red 122) (3.8重量部)	カーボンブラック顔料 イエロー (C.I.Pigment Yellow 180) (4.5重量部)
外添加剤	疎水性シリカ (疎水化度70%) (0.7重量部) (0.7重量部) (0.7重量部) (0.7重量部)			

を、実施例1と同様の条件でトナーを作成し、同一のキ  
ャリアと所定量混合して現像剤とした。得られたトナー  
及び現像剤を用いて、実施例1と同様の評価を行なっ  
た。なお、得られたトナー及び現像剤の特性、更に、面\*

18	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂：軟化点110℃ 100重量部			
帯電制御剤	フッ素四級アンモニウム塩化合物 (1.0重量部) (1.0重量部) (1.0重量部) (1.2重量部)			
増色剤	カーボンブラック顔料 ブルー (C.I.Pigment Blue 15) (9.0重量部)	カーボンブラック顔料 シアン (C.I.Pigment Blue 15) (3.5重量部)	カーボンブラック顔料 マゼンタ (C.I.Pigment Red 122) (6.0重量部)	カーボンブラック顔料 イエロー (C.I.Pigment Yellow 180) (6.0重量部)
外添加剤	疎水性シリカ (疎水化度80%) (0.5重量部) (0.6重量部) (0.7重量部) (0.7重量部)			

を、実施例1と同様の条件でトナーを作成し、同一のキ  
ャリアと所定量混合して現像剤とした。得られたトナー  
及び現像剤を用いて、実施例1と同様の評価を行なっ  
た。なお、得られたトナー及び現像剤の特性、更に、面

19	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点98℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩/サリチル酸誘導体亜鉛塩 (1.0/0.5重量部) (0.8/0.7重量部) (0.6/0.8重量部) (0.4/0.9重量部)			
着色剤	カーボンブラック顔料/タロシアニン/キナクリドン系顔料/アノ系顔料 ブルー (C.I.Pigment Blue 15) (C.I.Pigment Red 122) (C.I.Pigment Yellow 180) (9.0重量部) (3.5重量部) (6.0重量部) (5.8重量部)			
外添加剤	疎水性シリカ (疎水化度80%) (0.6重量部) (0.6重量部) (0.7重量部) (0.7重量部)			

を、実施例1と同様の条件でトナーを作成し、同一のキヤリアと所定量混合して現像剤とした。得られたトナー及び現像剤を用いて、実施例1と同様の評価を行なった。なお、得られたトナー及び現像剤の特性、更に、面

を、実施例1と同様の条件でトナーを作成し、同一のキヤリアと所定量混合して現像剤とした。得られたトナー及び現像剤を用いて、実施例1と同様の評価を行なった。なお、得られたトナー及び現像剤の特性、更に、面

21	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂：軟化点105℃ 100重量部			
帯電制御剤	含フッ素四級アンモニウム塩化合物 (1.0重量部) (1.0重量部) (1.0重量部) (1.0重量部)			
着色剤	カーボンブラック顔料/タロシアニン/キナクリドン系顔料/アノ系顔料 ブルー (C.I.Pigment Blue 15) (C.I.Pigment Red 122) (C.I.Pigment Yellow 180) (1.2重量部) (5.0重量部) (9.0重量部) (9.0重量部)			
外添加剤	疎水性シリカ (疎水化度30%) (0.8重量部) (0.8重量部) (0.8重量部) (0.8重量部)			

を、実施例1と同様の条件でトナーを作成し、同一のキヤリアと所定量混合して現像剤とした。得られたトナー及び現像剤を用いて、実施例1と同様の評価を行なった。なお、得られたトナー及び現像剤の特性、更に、面

を、実施例1と同様の条件でトナーを作成し、同一のキヤリアと所定量混合して現像剤とした。得られたトナー及び現像剤を用いて、実施例1と同様の評価を行なった。なお、得られたトナー及び現像剤の特性、更に、面

を、実施例1と同様の条件でトナーを作成し、同一のキヤリアと所定量混合して現像剤とした。得られたトナー及び現像剤を用いて、実施例1と同様の評価を行なった。なお、得られたトナー及び現像剤の特性、更に、面

を、実施例1と同様の条件でトナーを作成し、同一のキヤリアと所定量混合して現像剤とした。得られたトナー及び現像剤を用いて、実施例1と同様の評価を行なった。なお、得られたトナー及び現像剤の特性、更に、面

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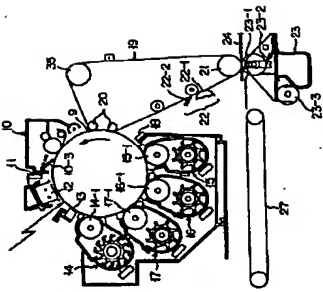




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(15)

【図4】



フロントページの続き

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